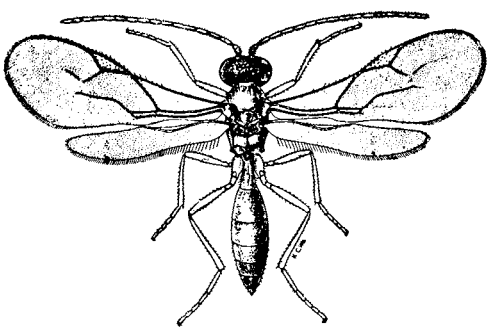
Special publication No. 11 **July, 1977**

GENUS APHIDIUS (APHIDIIDAE, HYM.) OF CALIFORNIA

CHING-SHEN GABRIEL LIU

This thesis submitted in partial satisfaction of the degree of master science in Entomology of California, Berkeley



Published by

The Taiwan Agricultural Research Institute Taipei, Taiwan, China

Thanks are given to Taiwan Agricultural Research Institute for supporting my aphid parasite research and publication of this thesis.

Genus *Aphidius* (Aphidiidae, Hym.) of California

By

Ching-Shen Gabriel Liu

B.S. (Taiwan Provincial Chung-Hsing University) 1964

THESIS

Submitted in partial satisfaction of the requirements for the degree of

MASTER OF SCIENCE

in

Entomology

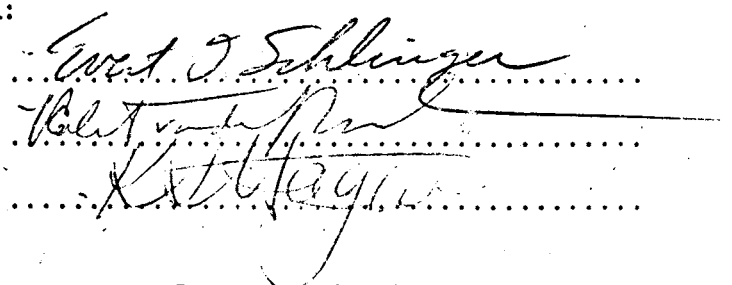
in the

GRADUATE DIVISION

of the

UNIVERSITY OF CALIFORNIA, BERKELEY

Approved:



Committee in Charge

Degree conferred.....

Date

Genus Aphidius (Aphidiidae, Hym.) of California

Ching-Shen Gabriel Liu

ABSTRACT

The intent of this thesis is to present a systematic revision of Aphidius species occurring or likely to occur in California. There are fourty-four species included in this paper, twenty-nine of which are given full systematic treatment. Eight of these were previously known in California, thirteen are recorded for the first time in this state, and eight more are new species. Fifteen species are only listed in the appendix due to lack of female specimens or host information.

Adults of Aphidius are small, morphologically similar wasps, difficult to recognize. In this paper one hundred fifteen figures are included to assist understanding the morphological characteristics which are discussed in the key, the diagnoses and the descriptions.

The genus Aphidius is holarctic in distribution, and several species are native to western North America. Some species have been accidentally or intentionally introduced from Europe or the Orient for biological control of aphid pests. Maps are included to show the distribution of species collected in California.

This thesis consists of a key to species, a taxonomic treatment of important species in California, and an index of host/parasite associations as an appendix. The key combines in-

formation on morphology and hosts with references to figures to aid in distinguishing species. The taxonomic treatment of each species includes synonymy, systematic relationship, morphological description or diagnosis, type or material data, geographical distribution and habitat information. The appendix gives general information regarding the parasite, host aphid and host plant relationships. Lot numbers, which are considered significant for further study or specimen examination are included with the host-parasite relationship data.

CONTENTS

Introduction 1

Acknowledgements 3

Methods and Materials 4

Collecting and Card File Data 4

Rearing 4

Mounting 5

Measuring 5

Drawings and Photographs 7

Materials 7

Taxonomical characters 8

Biology of Aphidius 9

Aphidiidae 10

Genus Aphidius 10

Relationship to other Aphidiinae 11

Distribution 11

Host relationships 11

Key to species 12

Species Treatment 20

Aphidius absinthii Marshall 20

A. alius Muesebeck 21

A. amelanchieri n. sp. 23

A. amphorophori n. sp. 24

A. areolatus Ashmead 26

A. asteris Haliday 28

Aphidius avenaphis (Fitch) 30

A. cingulatus Ruthe. 32

A. dauci Marshall 34

A. delicatus Baker 35

A. floridaensis Smith. 37

A. gifuensis Ashmead 38

A. liriodendrii n. sp. 40

A. lonicerae Marshall 41

A. lupini n. sp. 43

A. masonaphis n. sp. 45

A. matricariae Haliday 46

A. montereyensis n. sp. 48

A. nigripes Ashmead 50

A. ohioensis Smith 51

A. phorodontis Ashmead 53

A. pisivorous Smith 54

A. polygonaphis (Fitch) 55

A. pteridis n. sp. 57

A. ribis Haliday 58

A. rosae Haliday 60

A. salicis Haliday 61

A. smithi Sharma & Rao 62

A. vaccinii n. sp. 64

Appendix 67

Literature cited 76

Plates I - XII 84

Maps 108

INTRODUCTION

Aphidius is a large and complicated genus with approximately seventy species recorded in the world. In 1901, Baker discussed aphid parasites of North America and named four new *Aphidius* species but with brief descriptions, no host records, and some only from male specimens. These species were later redescribed by Mackauer (1963a). Gahan (1911) published his *Aphidiinae of North America* and combined *Pauesia* with *Aphidius* which included twenty-three species. In 1944, C. F. Smith defined *Aphidius* to include the subgenera *Aphidius*, *Protaphidius* (*Pauesia*), *Lysiphlebus* and *Lysaphidus*.

In the years 1956-68, Muesebeck and Mackauer described several new species of North American aphid parasites. No regional taxonomic work had been attempted previously on the aphid parasites of California, but Schlinger and Hall (1960) discussed eight species of *Aphidius* and their hosts in California. In the present work twenty-nine species are included of which eight are new species.

Interest in a systematic treatment of California aphid parasites, with information on their habitats and host relations, stems from their use as biological control agents of aphids. A group of entomologists at the University of California, Riverside, carried out biological control work on aphids, particularly on alfalfa. The bulk of the specimens forming the basis of the present study were contributed by the individuals involved in

this aphid-parasite project, with additional specimens added from collecting trips to British Columbia, Mississippi, Arkansas and other areas by E. I. Schlinger, R. Van den Bosch, J. C. Hall and graduate students associated with those projects. Approximately 4000 specimens were made available to the author.

The purpose of this study is to further the application of aphid biological control through availability of information regarding nomenclature, morphological recognition, geographical distribution, habitat and host relationship of Aphidius species.

ACKNOWLEDGEMENTS

I am indebted to Prof. E. I. Schlinger who provided me the opportunity to study the collection of California aphid parasites and transmitted to me his extensive knowledge of this field; to Prof. R. Van den Bosch and Prof. K. Hagen for advice in my research; to Prof. R. C. Dickson for the identification of the aphid hosts; to D. S. Green for assistance with plant host and habitat information; to the Taiwan Provincial Government for offering me a two year fellowship at University of California, Berkeley; to V. K. John for typing the manuscript, and to many others who contributed to the collections used in this study.

Thanks are given to the National Science Foundation (GB-4029) for the initial grant to R. Van den Bosch and E. I. Schlinger which enabled this large host-associated collection to be gathered and made available for this study.

The following list of names is referred to by initials in the text and indicates the collectors and the institutions concerned:

E. I. Schlinger (EIS), Univ. of California, Berkeley; F. G. Andrew (FGA), State Agriculture Dept., California; J. C. Hall (JCH), Univ. of Calif., Riverside; P. H. Timberlake (PHT) emer., Univ. of Calif., Riverside; P. A. Rauch (PAR), Univ. of Calif., Berkeley; R. Van den Bosch (RVB), Univ. of California, Berkeley.

METHODS AND MATERIALS

Collecting and Card File Data-- The specimens necessary for a valuable aphid parasite study are parasites, aphids and host plants. In the field, aphids were collected with a part of their host plant in a plastic bag. A piece of the host plant on which there are aphids is placed in a clean dry container for emergence of parasites. A few adult aphids are preserved in alcohol. A specimen of the plant, including flowers and fruits if available, is pressed for future identification.

The field notes were noted on a card file with a card for each aphid species collection. These notes included for each collection a record of the locality, habitat, date, description of the plant, description of the aphid (main morphological features, color), aphid's distribution on host plant and population density, etc. All components of each collection are labeled with a lot number which includes collector, year, month, day and number of sample that day. For example: E73-7-31a, where, E = E. I. Schlinger, 73 = 1973, 7 = July, 31 = 31st day, and a = 1st sample.

Rearing-- If two or more species were found parasitizing the same aphid colony, individual rearing of the mummified aphids were set up in small individual vials for emergence. This is the only sure way to obtain correct data associating a particular parasite with its aphid host. Another advantage of this method was that it prevented hyperparasites which emerged from one pri-

mary paraiste from infesting the remaining primary paraistes. Bulk rearing was often more convenient, however, particularly for rich samples.

Mounting-- Specimens were mounted on paper points, the tip of the point glued to side of thorax, with the mummified aphid glued onto the middle of the point. The specimen should be labeled with collecting date, locality, collector, host aphid, host plant and collecting lot number. For a more detailed morphological comparison, a slide preparation of genitalia and fore wing were made at a later date. Mounting the genitalia on slides was done as follows: abdomen was removed from parasite specimen, placed in 10% KOH solution, and warmed with a 60 watt electric light bulb (about 50°C) until the abdomen looked clear and its segments were loose (about 1-2 hours); after standing in water 20 minutes for washing, the abdomen was put into the mounting medium (Hoyer's Chloral Hydrate) on a clean slide and cover slip was carefully applied. The slides for the fore wings were made by removing the wing directly from the body and placing it directly into the mounting medium.

Measuring-- The angle from which the specimen was viewed while measurements were made was extremely important. The following list of measurements explains how each was made:

1) Width and length of head in dorsal view was measured with the occipital margin vertically straight.
2) Facial width was measured at the shortest distance between the eyes (see fig. 1).

3) Facial height was measured from the lower margin of the antennal socket to the upper margin of the clypeus (see fig. 1).

4) Tentoriocular line was measured at the shortest distance between the eye and the tentorial pit. (see fig. 1).

5) Intertentorial line was measured at the shortest distance between the two tentorial pits (see fig. 1).

6) Gena was measured at the shortest distance between the eye and the mandible (see fig. 1).

7) The height of the clypeus was measured at the maximum height of clypeus (see fig. 1).

8) The width of clypeus was measured at the maximum width of clypeus (see fig. 1).

9) Temple was measured at the shortest distance between the eye and the occipital margin (see fig. 2).

10) Transverse and longitudinal eye diameter was measured transversally and longitudinally at the maximum diameter of eye (see fig. 1).

11) The width of the stigma was measured from the upper margin to the point connecting it with the 1st abscissa (see fig. 4).

12) The length of the stigma was measured from the point connecting with costa to the point connecting with the metacarpus (see fig. 4).

13) Metacarpus was measured from the point connecting with the stigma to the terminal point of the metacarpus (see fig. 4).

14) 1st and 2nd abscissa of radius were measured at their terminal points (see fig. 4).

15) The length of the petiole was measured at its maximum length.

16) The width of the petiole was measured at its width at the spiracles.

17) The length of the ovipositor sheath was measured at its maximum length (see fig. 2).

18) The width of the ovipositor sheath was measured at its maximum width (see fig. 2).

Drawings and photographs-- Drawings of the head, antenna, propodeum, and petiole were made using microscopic gridding. The genitalia were drawn using Camera Lucida equipment. The photographs of the fore wings were taken through a low power microscope with a Nikon FTN. All drawing and photographs were made by the author.

Materials-- The specimens forming the basis of this study are from the University of California, Berkeley, under the care of E. I. Schlinger. They were prepared with excellent collecting data, including locality, date, lot number, host aphid, host plant, associated insects, hyperparasites and habitat. Besides the North American specimens, there were some specimens from Formosa, Japan, South America and Europe which were used for com-

parative purposes. There are all together approximately 4000 specimens of Aphidius in the collection.

The holotypes of the new species described in this paper will be temporarily deposited in the Entomological Museum at the University of California, Berkeley, and later they will be placed in the California Academy of Sciences Collections in San Francisco, California.

TAXONOMIC CHARACTERS

The species of Aphidius are all small in size and morphologically similar. The characters used to distinguish species are as follows:

Head-- Between species differences occur in head shape in both dorsal front views; eye size and their position, more frontal or occipital; clypeal shape and size, and the position of antennal insertion. Measurements of the length and width of the head, facial width and height, tentoriocular line, intertentorial line, the height and width of clypeus, transverse and longitudinal eye diameter, temple width and gena width are useful characters. The number of antennal segments and particularly the shape of the 1st flagellar segment, whether slender of stout, are also important characters.

Thorax-- The venation of fore wing, the structure of propodeal carinae, and the expression of the notaulices are the main thoracic characters used to identify species. Propodeal characters include the shape of propodeal areola, the horizontal level

of transverse carinae and the presence and relative elevation of longitudinal carinae. Drawings are necessary to explain these characters. Useful venational characters include the shape of the stigma, the length of the metacarpus, the length of the 1st and 2nd abscissa or their ratios, the angle of the 1st and 2nd abscissa, and the shape of the medioradial cell.

Abdomen-- The petiole and especially the female genitalic characters are important structures to distinguish species in this genus. The petiole may be slender or stout, with or without a prominent spiracular tubercle, and with its posterior portion swollen or parallel-sided. The female genitalia include characters such as the ventral prong on the 9th tergite, either large or small and slender or broad, and the shape of the ovipositor sheath, which is slender or stout

BIOLOGY OF APHIDIUS

Aphidius are primary, solitary, internal parasites of aphids. The female adult oviposits inside the aphid body. Three instars develop inside the aphid, after which the parasite larva pupates inside the aphid causing it to become mummified. Usually the wasp emerges through a small hole chewed between the cornicles of the aphid's abdomen. It takes approximately 8-15 days to mature and there are several generations per year. Longevity is dependent on temperature.

Acticles dealing mainly with biology and ecology of this

genus are those by Millan (1956) on Aphidius platensis Bretheses, Schlinger (1960) on several species, Schlinger & Hall (1960) on several species, Wiackowski (1962) and Van den Bosch et al. (1966) on Aphidius smithi Sharma & Rao, Schlinger & Mackauer (1963) on Aphidius matricariae Haliday, and Stary (1970) on several European species.

APHIDIIDAE

Genus Aphidius

Incubus Schrank, 1802:315 (Type: Ichneumon aphidum Linne) (name suppressed by opinion of Internation Commission).
Aphidius Nees, 1818:302 (Type: Aphidius avenae Haliday)
Theracmion Holmgren, 1872:99 (Type: Theracmion arcticus Holmgren)
Euaphidius Mackauer, 1961:110 (Type: Aphidius pterocomae Ashmead) New synonym.

Diagnosis-- Female: Face 1/2-1/3 as wide as head, clypeus small and convex, antenna 13-23 segmented; notaulices distinct only on basal part, propodeum with a relatively small central areola; fore wing with triangular to nearly lanceolate stigma, radius not reaching wing margin, radial and medial cell confluent, separated by cross vein on external side and by fused intermedian and median vein on the lower side (fig. 4); petiole usually with keel on central part; genitalia with short ovipositor sheath (fig. 2)

Male-- Similar to the female except for primary sex char-

acters, 2-3 more antennal segments, body size generally smaller, eye comparatively smaller and darker in color.

Relationship to other Aphidiinae-- There are 13 genera in Aphidiini as listed in Mackauer and Stary (1967). Five genera in North America, Lysiphlebus, Lysaphidus, Pauesia, Diaeretiella and Diaeretus, appear to relate to Aphidius. Morphologically Aphidius is more similar to Pauesia in venation but differs from the latter in having a propodeal areola and its host preference restricted to Aphidinae. It is related to Lysiphlebus, Lysaphidus, Diaeretiella and Diaeretus in size and by the shape of the ovipositor sheath, but differs from them in having an intermedian and median vein.

Distribution-- nearly cosmopolitan.

Host Relationships-- Based on the specimens examined and past records, there are 13 genera of Macrosiphinae, as well as Periphyllus and Pterocomma which act as hosts of Aphidius in North America.

KEY TO SPECIES OF *APHIDIUS* FEMALES FOUND OR LIKELY TO OCCUR IN CALIFORNIA

1. Antenna 13-15 segmented 2
   Antenna more than 15 segmented 9
2. Metacarpus subequal to stigmal length or longer (figs. 98, 108); parasites of *Myzus* and *Phorodon* 3
   Metacarpus distinctly shorter than stigmal lenth (figs. 102, 103, 105, 107, 109, 110); parasites of other aphids 4
3. Stigma broad, 3.2-3.4 times as long as wide, 2nd abscissa longer than half of 1st (fig. 98); clypeus of females usually yellow, distinctly lighter than the vertex; mostly a parasite of *Myzus* . . . . *A. matricariae* Haliday
   Stigma narrow, 4.2-4.4 times as long as wide, 2nd abscissa equal to half of 1st (fig. 108); clypeus of female usually brown and concolorous with vertex; parasite of *Phorodon* . . . . . *A. phorodontis* Ashmead
4. Antenna 15 segmented; parasites of *Acyrthosiphon*, *Capitophorous* and *Macrosiphum* 5
   Antenna 13-14 segmented; parasite of *Cavariella* and *Periphyllus* 7
5. Stigma thicker, 3 times as long as wide; metacarpus short, equal to 1.1-1.3 times of stigmal width (fig. 103); parasite of aphids on Rosaceae . . . . . *A. alius* Muesebeck
   Stigma narrow, its length longer than 3 times its width,

metacarpus equal to 2.6 times of stigmal width or longer (figs. 102, 105) 6

6. Petiole stout, 2.5 times as long as wide at spiracles; propodeal areola widely pentagonal (fig. 31); parasite of Capitophorous . . . . . A. ribis Haliday

Petiole slender, 3.5-4.0 times as long as wide at spiracles (fig. 49); propodeal areola small and narrow (fig. 27); parasite of Acyrthosiphon on Amelanchier . . . . . A. amelanchieri n. sp.

7. Temple slightly convex behind the eye in dorsal view; head more transverse, equal to twice as long as wide in dorsal view (fig. 7); antenna strongly thickened towards tip; parasite of Periphyllus . . . . . A. areolatus Ashmead

Temple rather convex behind the eye in dorsal view; head thicker, its height more than 1/2 of its width in dorsal view (fig. 8); antenna weakly thickened towards tip; parasite of Cavariella 8

8. Metacarpus short, equal to 1/2 times of the stigmal length, median vein effaced; antenna usually 13 segmented (fig. 109); body small about 1.5-2.0 mm. . . . . A. salicis Haliday

Metacarpus longer than 1/2 of stigmal length, median vein distinct (fig. 107); antenna usually 14 segmented; body large about 2.2-2.7 mm. . . . . A. dauci Marshall

9. Ovipositor sheath slender, more than twice as long as wide at maximum width (figs. 62, 65, 66, 73, 74); mostly

parasite of Macrosiphoniella or Amphorophora 10

Ovipositor sheath short, twice as long as wide or less (as in fig. 84); parasites of other aphids 14

10. Head and thorax bright lemon yellow, ocelli usually surrounded by small dark area . . . . . A. floridaensis Smith

Head and thorax not wholly yellow at least the vertex of head dark brown to black 11

11. Metacarpus subequal to the stigmal length (5:6 in ratio), 1st abscissa equal to 2.3 times cross vein (fig. 95); propodeum with faint longitudinal carinae on upper part; antenna usually 18 segmented (fig. 34) . . . . . A. polygonaphis Fitch

Metacarpus distinctly shorter than 2/3 of stigma, 1st abscissa shorter than twice of cross vein (about 1.5-1.6) (figs. 96, 97, 112); propodeum usually with distinct longitudinal carinae on upper part (fig. 23); antenna usually less than 18 segmented 12

12. 1st flagellar segment of antenna 4 times as long as wide (fig. 21); antenna 17 segmented; mostly parasite of Macrosiphoniella on Artemisia douglasiana . . . . . A. absinthii Marshall

1st flagellar segment of antenna short, about 2.5-3.0 times as long as wide (fig. 22); antenna 16 segmented . . 13

13. Ovipositor sheath distinctly long, 3 times as long as wide at maximum (fig. 66); petiole stout, 2.5 times as

long as wide at spiracles (fig. 38); parasite of Amphorophora on Epilobium . . . . . A. amphorophori n. sp.

Ovipositor sheath short, 2.3 times as long as wide (fig. 65); petiole slender, 3.2 times as long as wide at spiracles (fig. 45); parasite of Macrosiphoniella on Artemisia Dracunculus . . . . . A. delicatus Baker

14. Head in dorsal view rather transverse, twice as wide as long; face wide, equal to 1/2 as wide as head or subequal twice of its height (as 17:9)(fig. 12); parasite of Pterocomma . . . . . A. cingulatus Ruthe

Head in dorsal view thicker and less than twice as wide as long; face narrow, less than 1/2 of head-width or less than twice of its height (figs. 10, 11, 14, 15, 16) 15

15. Propodeum distinctly darker than thorax; commonly a parasite of Acyrthosiphon pisum . . . A. smithi Sharma & Rao

Propodeum unicolorous with thorax or lighter 16

16. Petiole slender, 4.5-5 times as long as wide at spiracles; stigma narrow, 5 times as long as wide . . . . . A. masonaphis n. sp.

Petiole 4 times as long as wide at spiracles or less; stigma 4.4 times as long as wide or less 17

17. Metacarpus as long as stigmal length, 1st abscissa almost equal to 2nd (fig. 87); usually a parasite of Myzus . . . . . A. gifuensis Ashmead

Metacarpus shorter than stigmal length, and 2nd abscissa

shorter than 1st; parasite of other aphids 18

18. Stigma narrow around 4.0-4.4 times as long as wide 19

Stigma thick around 2.7-3.5 times as long as wide 26

19. Thorax and tergite I unicolorous, body wholly black, pronotum and tergite I sometimes slightly lighter than mesoscutum but usually not yellowish brown . . . . A. nigripes Ashmead

Thorax and tergite I not unicolorous or yellowish, body usually dark brown to yellowish-brown, pronotum yellowish-brown or yellow 20

20. Ovipositor sheath long (figs. 69, 76), twice as long as wide or longer 21

Ovipositor sheath stout (as in fig. 67), 1.5 times as long as wide or less 22

21. Petiole stout, 2.8-3.0 times as long as wide at spiracles; ratio of metacarpus to stigmal length as 1:1.2 (fig. 106), ratio of tentoriocular line to intertentorial line as 2:5; antenna 17-18 segmented; genitalia with slender ventral prong on 9th tergite (fig. 69); Specimen usually shorter than 3 mm. . . A. rosae Haliday

Petiole slender, 3.8-4.0 times as long as wide at spiracles (fig. 53); ratio of metacarpus to stigmal length as 2:3 (fig. 89); ratio of tentoriocular line to intertentorial line as 1:2; antenna 18-19 segmented; genitalia with broad ventral prong on 9th tergite (fig. 76); specimen usually longer than 3 mm. . . . . A. lonicerae Marshall

22. Antenna 16-17 segmented; metacarpus subequal to stigmal length about 10:13 in ratio (fig. 111); ratio of face to head as 1:2.2; parasite of Macrosiphum on Graminae . . . . . A. avenaphis (Fitch)

Antenna 18 segmented or more; metacarpus distinctly shorter than stigmal length (less than 1/1.4 of stigma); ratio of face to head as 1:2.5 (figs. 14, 16) except for A pisivorous (fig. 10); parasite of other aphids 23

23. Petiole stout, about 2.5 times as long as wide at spiracles, posterior portion rather dilated and 1/3 wider than anterior portion (fig. 39), face broad, ratio of face to head as 1:22 (fig. 10) . . . . . A. pisivorous Smith

Petiole slender about 3.5-4.0 times as long as wide at spiracles and almost parallel-sided (figs. 43, 55); face narrow, ratio of face to head as 1:2.4 - 2.6 (figs. 14, 16) 24

24. Propodeum with longitudinal carinae very closely parallel on basal part (fig. 33); ratio of metacarpus to stigmal length as 1:1.4; 1st abscissa inserted near middle of stigma (fig. 101) . . . . A. liriodendrii n. sp.

Propodeum with longitudinal carinae more or less widely separated on basal part (fig. 36); ratio of metacarpus to stigmal length as 1:1.8-2.0; 1st abscissa inserted at about basal 1/3 of stigma (figs. 86, 92) 25

25. Thorax wholly dark brown; ovipositor sheath strongly extended backwards, ventrally (fig. 56); parasite of Masonaphis on Vaccinium . . . . . A. vaccinii n. sp.
Thorax lemon yellow, but mesoscutum brown; ovipositor sheath weakly extended backwards, ventrally; parasite of Macrosiphum on Salix . . . . . A. montereyensis n. sp.

26. Antenna 17 segmented or less; stigma thicker about 2.7-3 times as long as wide (figs. 99, 103, 104); parasites of aphids on Rosa or on composites 27
Antenna 18 segmented or more; stigma narrow about 3.3-3.5 times as long as wide (figs. 93, 94); parasites of aphids on ferns of Lupinus 29

27. Propodeum with carinae widely separated on basal part, usually with longitudinal carinae on upper part effaced; antenna usually 17 segmented . . . . . A. ohioensis Smith
Propodeum with longitudinal carinae close or sometimes parallel, on basal part, usually longitudinal carinae on upper part present (fig. 24); antenna usually 15-16 segmented 28

28. Metacarpus short and equal to 1/2 of stigmal length; the angle of 1st and 2nd abscissa around 100-110 degrees (fig. 103); ovipositor sheath stout, length to width as 1.4:1 (fig. 79); parasite of aphids on Rosa . . . . . A. alius Muesebeck
Metacarpus longer than 1/2 of stigmal length, the angle of 1st and 2nd abscissa around 160-170 degrees (fig. 104);

ovipositor sheath slender, its length to width greater than 1.5:1 (fig. 82); mostly a parasite of Dactynotus on Compositae . . . . . A. asteris Ashmead

29. Head fairly transverse, 1.7 times as wide as long in dorsal view; face narrow, equal to 1/3 of head-width (fig. 11); ovipositor sheath with tubercle-like protuberance on upper side of basal part (fig. 61); parasite of aphids on fern . . . . . A. pteridis n. sp.

Head thicker, 1.5 times as wide as long in dorsal view; face width to head width as 1:2.3 (fig. 15); ovipositor sheath without tubercle-like protuberance on upper side of basal part (fig. 64); parasite of aphid on Lupinus . . . . . A. lupini n. sp.

SPECIES TREATMENT

Aphidius absinthii Marshall

Aphidius absinthii Marshall, 1896: 605 (♂, England, host). For complete synonymy, see Stary & Schlinger (1967) and Takada (1968). Aphidius commondus Gahan, 1926: 3.

This species is characterized by having a short metacarpus, and a long ovipositor sheath which is slightly curved upwards. It is closely related to other Macrosiphoniella parasites like A. polygonaphis and A. delicatus. It differs from the former in having a shorter metacarpus and radius, from the latter in having a longer ovipositor sheath.

Diagnosis-- Female: Head fairly wide, about 2.2 as wide as face; antenna 17-segmented, 1st flagellar segment 4 times as long as wide (fig. 21); fore wing with short metacarpus about equal to 5/8 of stigmal length; 1st abscissa about equal to stigmal width (as 11:12) and to 2nd abscissa, and 1.5 longer than cross vein (fig. 96); propodeum with narrow pentagonal areola (fig. 23); petiole stout, about 2.5 as long as wide at spiracles; genitalia with ventral prong on 9th tergite broad, ovipositor sheath slender (fig. 73).

Male-- Similar to the female except for primary sex characters and in having an 18-20 segmented antenna.

Material Examined (24♀♀, 15♂♂)-- CALIFORNIA: 12♀♀, 8♂♂, III-13-66 (#E66-3-13e, EIS), 10♀♀, 7♂♂, III-30-60 (#60-3-30c, JCH), Riverside, Riv. Co.; 10♀♀, 7♂♂, IV-29-66 (#66-4-29f, EIS), Temecula Cyn., Santa Margarita River, San Diego Co.

Aphid hosts-- (see Appendix).

Known Distribution-- Europe, South Korea, Japan, Hong kong, Taiwan.

New Distribution-- California (see Map 1, #3).

Habitat Information-- This species, which parasitizes Macrosiphoniella species associated with Artemisia & Achillea in Europe and the Orient, is widely distributed in rather dry areas, yet apparently is restricted in California to the semi-dry areas of southern California associated with Artemisia.

Aphidius alius Muesebeck

Aphidius alius Muesebeck, 1968: 142 (♀,♂). Schlinger & Hall 1960: 405 (host, diapause).

This species is characterized by a thick stigma, a short metacarpus and by genitalic characters. It appears similar to A. ohioensis and A. asteris but it differs from the former by the shape of the propodeal carinae, and differs from the latter by the leg coloration and the comparatively short ovipositor sheath.

Diagnosis-- Female: Specimen length 2.0-2.5 mm., head about equal to 2.5 facial width, eyes convergent towards clypeus, tentoriocular line equal to 1/2 of intertentorial line; genal width to longitudinal eye-diameter as 1:3.7; antenna 15-16 segmented, first flagellar segment 2.5-3.0 as long as wide; fore wing with thick stigma, about 3 times as long as wide, with short metacarpus, about equal to 1/2 of stigmal

length with 1st abscissa equal to stigmal width or 2 times that of 2nd (fig. 103); petiole stout, about 3 times as long as wide at spiracles, posterior portion dilated and 1/3 wider than its anterior portion (fig. 48); genitalia with broad ventral prong on 9th tergite and a stout ovipositor sheath (fig. 79); color brownish-black.

Male-- Similar to the female except for primary sex characters and by having an 18-segmented antenna.

Material Examined (72♀♀, 68♂♂)-- CALIFORNIA: 2♀♀, II-13-61, (E61-2-13b, EIS), 2♀♀, IV-13-58 (E58-3-24c, EIS), 2♀♀, 2♂♂, I-22-59 (E58-4-24a, EIS), 33♀♀, 36♂♂, III-18-60 (E60-4-10b, EIS), 2♀♀, III-30-60 (60-3-30a, A. Arakawa), 12♀♀, 10♂♂, IV-9-62 (E62-4-9a, EIS), Riverside, Riv. Co.; 3♀♀. V-29-59 (59-5-29a, JCH), 10 mi, SC Hemet, Riv. Co.; 4♀♀, 1♂, V-19-12 (PHT), Whittier, Riverside Co.; 3♂♂, XII-25-57 (57-12-25, JCH), Reedly, Fresno Co.; 3♀♀, 11♂♂, V-4-66 (66-5-4a, FGA), Cajon Cyn., San Bernardino Co.; 3♀♀, 4♂♂. IV-17-60 (60-4-10b, EIS), Glendale, Los Angeles Co.. BRITISH COLUMBIA: 2♀♀, VII-4-66 (G66-7-4a, A. Gutierrez), 2 mi, S. Spences Bridge.

Mummified Aphids-- Specimens in the UCB collection are pale brown, including the paratypes cited by Muesebeck. The host is Acyrthosiphon porosus (E60-4-10b) and can easily be distinguished by the characters in having the frontal tubercles prominently converging and the cornicle without reticulation.

Aphid Hosts (see Appendix)

Known Distribution-- California (see Map 2)

New Distribution-- British Columbia.

Habitat Information-- This species parasitizes Myzus porosus where they feed on the leaves and stems of cultivated roses. In addition, this species has been found to attack Macrosiphum solanifolii, M. rose and Wahlgreniella nervata when they inhabited the same rose plants with M. porosus(=Acyrthosiphon porosus).

Aphidius amelanchieri n. sp.

This species is characterized by a short antenna, a narrow and small propodeal areola, and the small ventral prong on 9th tergite. Morphologically it is related to A. rosae and A. alius, but differs from the former in having a fewer antennal segments and differs from the latter in having a small ventral prong on 9th tergite and a relatively slender ovipositor sheath.

Description-- Female: Specimen length 2.0 mm., fore wing 1.5 mm., antenna 1.2 mm.; head about 1.5 as wide as high in dorsal view (fig. 9) and as wide as 2.3 times of facial width, tentoriocular line 2/3 as long as intertentorial line; clypeus somewhat triangular and moderately convex (fig. 13); eye middle-sized and slightly convergent towards clypeus; temple convex and subequal to transverse eye-diameter; gena as long as 1/4 of longitudinal eye-diameter; antenna 15-segmented, densely hairy, 1st flagellar seg. 2.5 as long as wide (fig. 18).

Notaulices distinct on basal part and somewhat visible trace reaching 4/5 of mesonotum; propodeum with narrow and small areola (fig. 27); fore wing with stigma narrow, 3.8 as long as wide and 1.5 as long as metacarpus, 1st abscissa insert on 2/5 basal stigma

and 1.4 as long as 2nd abs. (fig. 102).

Petiole slender, 2.5 as long as wide at spiracles, posterior portion slightly dilated, spiracular tubercle visibly prominent, basal part rugose (fig. 49); genitalia with small ventral prong on 9th tergite and slender ovipositor sheath (fig. 60).

Color, yellowish brown; head dark brown except yellowed face, mouthparts and gena; antenna dark except yellowed scape and pedicel; mesoscutum and metascutum brown; propodeum, pronotum and mesopleuron and metapleuron, legs and abdomen yellow.

Male-- Similar to the female except for primary sex characters and in having an 18 segmented antenna.

Types-- Holotype ♀, 2 mi, NW Courtenay, Vancouver Is., B.C., VII-2-66 (F66-7-2a, FGA), reared from Acyrthosiphon macrosiphum on Amelanchier sp.; Paratypes 2♀♀, 1♂, Skihist Camp, 5 mi., E. Lytton, B.C. VIII-3-66 (C66-7-3a, D. Calvert), 2♂♂. Macimieto, Monterey Co. Calif., VIII-8-62 (E62-8-8d, EIS, RVB), reared from A. macrosiphum on Amelanchier alnifolia.

Mummified Aphid-- Whitish-brown

Distribution-- (see Map 1, #2)

Habitat Information-- Based on our limited collecting data, it was known the parasites were reared from a scattered colony of aphids on the leaves of Amelanchier alnifolia in dry and rocky areas.

Aphidius amphorophori n. sp.

This species is easily distinguished by its distinctly long ovipositor sheath. Based on the genitalic characters it is

closely related to A. polygonaphis, but differs from it in venation by having a shorter metacarpus.

Description-- Female: Specimen length 1.6 mm, fore wing 1.3 mm.; head rather thick, about 1.4 as wide as high; eye comparatively small in dorsal view; temple convex behind eye and almost equal in width to transverse eye-diameter; occipital margin small, concave on central part; face broad, about equal to 1/2 of head-width and 1.6 as high as wide; clypeus triangular and moderately convex, tentoriocular line subequal to intertentorial line; gena as long as 1/2 of longitudinal diameter of eye; antenna 16-segmented, 1st flagellar seg. 3 times as long as wide (fig. 19).

Thoracic dorsal outline in lateral view more or less flat, scutellum slightly convex; fore wing with weak venation, stigma about 4 times as long as wide, 1st abscissa 1/5 shorter than stigmal width, 2nd abs. subequal to 1st (fig. 112); propodeum with faint longitudinal carinae (fig. 35).

Abdomen about 2 times as long as thoracic length; petiole stout, 2.5 as long as wide at spiracles, with shallow depressed area behind spiracles (fig. 38); genitalia with slender ventral prong on 9th tergite, and a rather slender ovipositor sheath, which slightly curves upwards (fig. 66).

Color, yellowish-brown; head brown except yellowed face, mouthparts and basal part of gena; antenna dark brown except yellowed scape and pedicel; thorax brown except yellowed pronotum; legs dark brown on femora, tibiae and tarsi; other parts yellow; abdomen yellowish brown but tergite I lighter colored; ovipositor

sheath dark brown.

Male-- Similar to the female except for primary sex characters and in having a 17-segmented antenna.

Types-- Holotype ♀, Riverside, III-1-61, #61-3-1a (K. Arakawa) reared from Amphorophora sp. on Epilobium angustifolium; 3♂♂ Paratypes, Riverside III-13-66, #E66-3-13c (EIS), reared from Amphorophora sp. on Rubus loganobaccus.

Mummified aphid (#61-3-1a) with prominent and converging front tubercles, and with swollen cornicle which is 1/6 longer than antenna, segment III.

Aphid hosts (see Appendix)

Distribution-- California (see Map 3, #2)

Habitat Information-- Little is known except that parasite appears to be restricted to Amphorophora sp. in open disturbed or garden areas in southern California.

Aphidius areolatus Ashmead

Aphidius areolatus Ashmead, 1906: 189, Watanabe, 1957: 2. Stary & Schlinger 1967: 15 (host, distribution).

This species is easily distinguished by its distinctly short antenna, a more transverse head, and by the diamond-shaped areola on the propodeum. Based on its morphology and host it is considered a primitive species in this genus. Mackauer (1961) chose to place it in the genus Euaphidius.

Diagnosis-- Female: Head rather transverse, about twice as wide as long in dorsal view (fig. 7) and 2.5 as wide as facial width in front view; tentoriocular line about equal to 1/3 of intertentorial line, gena narrow and subequal to 1/5 of longi-

tudinal eye-diameter; antenna 13-segmented, segments stout and densely hairy, 1st flagellar segment twice as long as wide (fig. 17); propodeum with a diamond-shaped areola (fig. 26); fore wing broad, its length little shorter than 1/2 of its length as 5:11, stigma thick, about 3.3 as long as wide, 1st abscissa distinctly longer than stigmal width, as 1.4:1, 2nd abscissa slightly shorter than 1st, as 7:9 (fig. 110); petiole short, 2.5 as long as wide at spiracles and parallel-sided (fig. 46); ovipositor sheath somewhat rectangular (fig. 77); color mostly blackish-brown.

Male-- Similar to the female except for sex primary characters and in having a 19-20 segmented antenna (Stary and Schlinger, 1967).

Material Examined-- CALIFORNIA: 2♀♀ (R. L. Tassan), Oakland, Alameda Co.

Aphid Hosts (see Appendix)

Known Distribution-- Japan

New Distribution-- California (Oakland) (see Map 1 #1)

Habitat Information-- This species was apparently accidently introduced from the Orient very recently. E. Schlinger (personal communication) said he had collected and reared the host aphids in California many times since 1958, and never reared any aphid parasites. The only record of this parasite in California is that cited above from Oakland, Calif. where the specimens were reared from Periphyllus californiensis on Acer palmatum (Japanese maple) in downtown Oakland on Leimert Blvd.

Because the host aphid is a common aphid in California on Acer sp., this parasite may become firmly established there in a short period.

Aphidius asteris Haliday (a species group)

Aphidius asteris Haliday, 1834: 100 (♀,♂). Mackauer, 1962: 113 (Lectotype).

This species group is characterized by a thick stigma about 2.7-3.0 as long as wide, a short 2nd abscissa, a propodeum with an enclosing an narrow rectangular areola, a broad ventral prong on the 9th tergite, an ovipositor sheath about twice as long as wide, and a host complex which appears to be primarily restricted to aphids on Compositae. There may be several, but not clearly distinguished, species involved in this species group. Therefore, a redescription of this species or species group seems advisable.

Redescription-- Female: Specimen length 2.1-2.8 mm.; head 1.6 as wide as long in dorsal view and 2.3 as wide as facial width in front view, tentoriocular line equal to 1/2 of intertentorial line, clypeus twice as wide as high, gena equal to 1/3 of longitudinal eye-diameter, temple narrower than transverse eye-diameter, as 10:13, eye convergent towards clypeus; antenna 16-17 segmented, 1st flagellar seg. 3.5-4.0 as long as wide.

Fore wing with thick stigma about 2.7-3.0 as long as wide, metacarpus to stigmal length as 1:1.6, 1st abscissa to stigmal width as 1:1.2 or to 2nd abs. as 1:1.5 or 2.0 (fig. 104); propodeum with an enclosing narrow rectangular areola (fig. 24).

Petiole about 3.3 as long as wide at spiracles, spiracular tubercles prominent and deeply depressed behind the spiracles, posterior portion gradually dilates towards 2nd tergite (fig. 50); genitalia with ventral prong of 9th tergite large and ovipositor sheath ventrally extended backwards (fig. 82).

Color, yellowish-brown; head dark brown except for yellowed scape; thorax dark brown except for yellowed pronotum; legs dark brown except for yellowed coxa, trochanter and intersegments; abdomen yellowish-brown except for dark brown tergite II, III and ovipositor sheath.

Male-- Similar to the female except for primary sex characters and in having an 18-19 segmented antenna.

Material Examined (268♀♀, 282♂♂)-- BRITISH COLUMBIA: 4♀♀, 4♂♂, VII-1-66 (66-7-1b, C. Lagace) 2 mi. N. Miracles Beach, Vancouver Island; 27♀♀, 10♂♂, VII-4-66 (F66-7-4i, FGA) 2mi., Spences Bridge; 8♀♀, 2♂♂, VII-4-66 (P66-7-4b, PAR), 8 mi., S.E. Spences Bridge; 13♀♀, 13♂♂, VII-1-66 (P66-7-1a, PAR), Oyster Bay, 1 mi..N. Oyster River, Vancouver Is.; 1♀, VII-3-66 (C66-7-3a, C. Lagace), Skihist Camp, 5 mi., E. Lytton; 4♀♀, 3♂♂, VII-4-66 (F66-7-4c), 8 mi, S. Spences Bridge; 1♀, 1♂, VII-16-60 (60-VI-28g, EIS) Bella Coola. CALIFORNIA: 6♀♀, 11♂♂, III-15-60 (60-3-15e, EIS), 4♀♀, 3♂♂, IV-14-60 (60-4-14a, EIS), 22♂♂, II-11-67 (F67-2-11a, FGA), 3♂♂, IV-30-59 (59-4-30a, EIS), 1♀, 1♂, IV-10-59 (59-4-10a, EIS), 10♀♀, 14♂♂, XII-31-62 (62-12-31a, EIS), 22♂♂, III-16-61 (61-3-16c, C. Lagace), 1♂, III-14-66 (E66-3-14b EIS), Riverside, Riv. Co.; 56♀♀, 29♂♂, III-26-66 (E66-3-26c, EIS), Box Springs Mt., Riverside Co.; 3♀♀, 5♂♂, III-13-60 (60-

-3-13a, EIS), 2♀♀, IV-17-60 (60-4-17b, EIS), Glendale, Los Angeles Co.; 3♀♀, 4♂♂, VIII-6-62, (62-8-6d, EIS) Pico Creek, San Luis Obispo Co.; 87♀♀, 98♂♂, VII-6-61 (61-7-6b, JCH), Santa Paula, Ventura Co.; 15♀♀, 27♂♂, IV-19-61 (61-IX-19b, EIS), Rancho Santa Fe, San Diego Co.; 8♀♀, 17♂♂, V-22-59 (59-4-22, EIS), Lake Hughes, Los Angeles Co.; 4♀♀, 3♂♂, VIII-10-65 (F65-8-10b, FGA), 4 mi, E. Oxnard, Ventura Co.;

Aphid Hosts (see Appendix I)

Known Distribution-- England, Germany

New Distribution-- British Columbia, California (see Map 4)

Habitat Information-- This is a very common parasite of Dactynotus and Macrosiphoneilla species, widely distributed throughout California, and usually found parasitizing aphids on leaves and stems of weedy composites in natural habitats.

Aphidius avenaphis (Fitch)

Praon avenaphis Fitch, 1865: 98.

Aphidius avenaphis: Gahan, 1911: 183. For complete synonymy, see Smith (1944).

This species is characterized by a comparatively small clypeus, a tentoriocular line equal to 2/3 of intertentorial line, a thumb-shaped ventral prong and a long dorsal prong on the 9th tergite. Based on the genitalic characters it is related to A. montereyensis n. sp. and A. avenae (= A. obscuripes Ashmead). It differs from the former in having a 16-17 segmented antenna and a broad ventral prong on the 9th tergite, and from the latter by a relatively narrower face.

Diagnosis-- Female: Head thick, about 1.4 as wide as long in dorsal view and 2.2 as wide as facial width in front view, clypeus small and round its ratio of height to width as 2:3, tentoriocular line equal to 2/3 of intertentorial line, gena equal to 1/3 of longitudinal eye-diameter, eye flat and as wide as temple; antenna 16-17 segmented, 1st flagellar seg. 3.5 as long as wide; fore wing with stigma 4 times as long as wide, metacarpus subequal to stigmal length as 10:13, 1st abscissa equal to 1.5 of stigmal width, 2nd abscissa subequal to 1st as 5:6 (fig. 111); propodeum with a narrow areola (fig. 29); petiole slender, 3.5-3.7 as long as wide at spiracles and somewhat parallel-sided (fig. 54); genitalia with broad ventral prong on 9th tergite and stout ovipositor sheath about 1.5 times as long as wide at maximum (fig. 85); color generally dark brown.

Male-- Similar to the female except for primary sex characters and in having a 17-19 segmented antenna.

Material Examined-- BRITISH COLUMBIA: 8♀♀, 5♂♂, VII-1-66 (C66-VII-1a, D. Calvert), 2 mi, N. Miracle Beach, Vancouver Island.

Aphid Hosts (see Appendix)

Known Distribution-- Ohio, Virginia, Indiana, South Carolina, California, Washington D.C., and Ottawa, Canada

New Distribution-- British Columbia

Habitat Information-- This is a common grass inhabiting species in North America which usually parasitizes aphids on the leaves and seed heads of their host plants.

Aphidius cingulatus Ruthe

Aphidius cingulatus Ruthe, 1859: 315. Stary 1961: 214 (Redescription).

Aphidius pterocommae Smith, 1944: 68. Schlinger & Hall 1960: 407 (host, diapause).

Euaphidius cingulatus Mackauer, 1961:641.

This species is characterized by its distinctly transverse head, broad face, curved 1st abscissa and round-shape ovipositor sheath. Based on genitalic characters it is related to Pauesia varigatus Smith. Mackauer (1961) chose to place it in the genus Euaphidius.

Diagnosis-- Female: Head rather transverse in dorsal view about twice as wide as long, occipital margin shallowly concave; face broad about equal to 1/2 of head-width (fig. 12) and somewhat elevated; tentoriocular line subequal to intertentorial line as 5:6; gena about as wide as 1/3 of longitudinal eye-diameter; antenna 19-20 segmented, 1st flagellar segment 3 times as long as wide; fore wing with stigma 3.2 as long as wide, ratio of metacarpus to stigmal length as 2:3, 1st abscissa slightly curved and its length as long as 1.7-1.8 of 2nd (fig. 114); propodeum with a rectangular areola; petiole slender, 4 times as long as wide at spiracles, posterior portion somewhat dilated, behind spiracles shallowly depressed; genitalia with small ventral prong of 9th tergite, ovipositor sheath densely hairy and roundly shaped (fig. 68); whole body clothed denser and longer hairs; color generally dark brown.

Male-- Similar to the female except for primary sex characters and in having a 20-22 segmented antenna.

Material Examined (9♀♀, 6♂♂)-- BRITISH COLUMBIA: 2♀♀, 1♂, VII-1-66 (P66-7-1b, PAR), Forbidden Plateau, W. Courtenay. CALIFORNIA: 1♂, VIII-19-56 (EIS), Golden Lake, Fresno Co.; 1♂, VI-16-63 (EIS) Cajon Pass, San Bernardino Co.; 4♀♀, VII-5-61 (71-7-6f, JCH), Santa Paula, Ventura Co.; 1♀, VI-28-61 (61-6-29c, EIS), Rancho Santa Fe, San Diego Co.; 1♂, IV-29-63 (EIS), Riverside, Riv. Co.; 2♂♂, V-23-15 (PHT) Stanford Univ., San Mateo Co. UTAH: (1♀, 1♂), 1♂, V-24-14 (PHT), Murray; 1♀, VII-28-13 (PHT), Twin Peak, Wasatch Mts.

Mummified aphid-- Its color varies from brown to blackish-brown. It is usually blackish-brown for P. populifoliae and P. smithiae, while it is brown for P. pseudopopulea and P. bicolor.

Aphid Hosts-- (see Appendix)

Known Distribution-- England, Czechoslovakia, Japan, North America (Ohio, Massachusetts, Washington, D.C., and California).

New Distribution-- British Columbia, Utah and California (see Map 5).

Habitat Information-- This parasite appears to be distributed unevenly throughout California, occurring in mountainous and coastal areas where it parasitizes Pterocomma aphids feeding on the stems of Salix and Populus species.

Aphidius dauci Marshall

Aphidius dauci Marshall 1896: 601 (♀,♂)

This species is characterized by a 14-segmented antenna, a stigma 3.8 as long as wide, a metacarpus 1/3 shorter than the stigmal length, and a broad ventral prong on the 9th tergite; morphologically it is closely related to A. salicis but differs from it in having antenna with more segments, metacarpus longer and 1st abscissa almost straight.

Redescription-- Female: Specimen length 2.5 mm., antenna 1.4 mm., fore wing 2.4 mm.; head thick, about 1.7 as wide as high in dorsal view and as wide as 2.5 of facial width in front view; occipital margin shallowly concave (fig. 8); face convergent towards clypeus and subequal to 1.3 of its height, tentoriocular line equal to 1/3 of intertentorial line; clypeus broad, slightly convex with ratio of height to width as 1:2; gena narrow, equal to 1/4 of longitudinal eye-diameter; temple convex and subequal to transverse eye-diameter; antenna 14-segmented, 1st flagellar seg. 2.4 as long as wide.

Notaulices distinct on basal part; fore wing with stigma 3.8 as long as wide, metacarpus 1/3 shorter than stigmal length, 1st abscissa almost straight and inserted near 1/3 of basal stigma, the length of 1st abs. subequal to 1.3 of stigmal width or 1.1 of 2nd (fig. 107); propodeum with an incomplete areola and very faint longitudinal carinae (fig. 32).

Petiole about 3 times as long as wide at spiracles; strongly carinarous on basal part, deeply depressed behind the spir-

acles and slightly dilated on posterior part (fig. 47); genitalia with broad ventral prong on 9th tergite and stout ovipositor sheath (fig 75).

Color, dark brown; head dark brown except for lighter brown mouthparts; antenna dark brown; thorax dark brown; legs yellowish-brown; abdomen dark brown except for caudal area, lighter brown.

Male: Similar to the female except for primary sex characters and in having an 18 segmented antenna.

Material Examined (65♀♀, 49♂♂)-- WASHINGTON: 63♀♀, 45♂♂, VI-26-66 (P66-6-26a, PAR, F66-6-26a, FGA), 2 mi, N. Queets, Jefferson Co.; 2♀♀, 4♂♂, VI-26-66 (C66-6-26a, D. Calvert), 10 mi, E. Pysht, Clallam Co.

Mummified aphid-- Color, dirty brown. The mummified aphids examined were mostly alates.

Aphid Hosts-- (see Appendix)

Known Distribution-- England

New Distribution-- British Columbia and Washington

Habitat Information-- This species was reared only from the aphid Cavariella pastinacae, which infested the host plant Heracleum lanatum.

Aphidius delicatus Baker

Aphidius delicatus Baker, 1909:24 (♂); Mackauer, 1963: 928 (redescription).

This species is characterized by a thick stigma, a short metacarpus and a slender ovipositor sheath. Based on the genitalic characters, it is related to A. absinthii but differs from

it in having a thicker stigma, a shorter metacarpus and a shorter 1st flagellar segment.

Description-- Female: Specimen length 2.3 mm.; antenna 1.3 mm., fore wing 1.3 mm.; head moderately thick about 1.6 as wide as long in dorsal view and 2.4 as wide as facial width in front view; tentoriocular line about equal to 1/2 of intertentorial line; gena subequal to 1/3 of longitudinal eye-diameter; antenna 16 segmented, 1st flagellar seg. 2.4-3.0 as long as wide (fig. 22).

Notaulices distinct on basal part and more or less wide, depressed trace posteriorally; propodeum with a completely narrow areola (fig. 28); fore wing with thick stigma about 2.8 as long as wide, metacarpus 1/2 shorter than stigmal length; 1st abscissa inserted near the middle of stigma, short and its length subequal to stigmal width; 2nd abscissa 1/5 shorter than 1st (fig. 97).

Petiole about 3 times as long as wide at spiracles, with distinct spiracular tubercle, posterior portion slightly dilated and depressed behind spiracles (fig. 45); genitalia with slender ovipositor sheath (fig. 65).

Color, dark brown; head dark brown except for yellowed face, clypeus, gena and mandible; antenna dark brown except for scape and pedicel color lighter; thorax dark brown except for pronotum lighter; abdomen generally yellow but posterior part of 2nd, 3rd and 4th segments tinged with dark brown bands, ovipositor sheath dark brown; front legs yellow, middle and hind

legs dark brown but sometimes tinged with yellowish-brown on coxa and trochanter.

Male; Similar to the female except for primary sex characters and in having a 17-segmented antenna.

Material Examined (3♀♀, 2♂♂)-- CALIFORNIA: 3♀♀, 2♂♂, VII-28-58 (58-7-29a, JCH), Riverside, Riverside Co.

Aphid Hosts-- (see Appendix)

Known Distribution-- Nevada (Ormsby Co.)

Habitat Information-- This species is known to parasitize only a species of Macrosiphoniella on an odorless Artemisia species in disturbed places in a dry habitat.

Aphidius floridaensis Smith

Aphidius floridaensis Smith, 1944: 56

This species is characterized by a relatively short 1st and 2nd abscissa, long ovipositor sheath, broad face and 17 segmented antenna; it appears close to A. polygonaphis but differs in having a comparatively short radius, long cross vein, and an ovipositor sheath narrowed on middle.

Morphologically this parasite appears similar to the Oriental species A. commondus Gahan and A. macrosiphoniella Takada, which are parasites of aphid Macrosiphoniella on host plant Artemisia.

Diagnosis-- Female: Specimen length 2.0-3.0 mm.; face broad and as wide as 1/2 of head width, tentoriocular line as long as 5/7 of intertentorial line; antenna 16-17 segmented (usually 17); fore wing with thick stigma, 3 times as long as

wide; 1st abs. equal to stigmal width, about equal to 2nd, the angle between 1st and 2nd abs. wide (fig. 100); propodeum with a narrow areola; petiole stout, 2.8 as long as wide at spiracles, posterior part dilated and 1/4 wider than anterior part; genitalia with ventral prong on 9th tergite gradually shaped and curved upwards, and ovipositor sheath slender and narrowed on the middle (fig. 74); color generally lemon yellow except for dark spots around occeli and sometimes dark bands on 2nd and 3rd tergites of abdomen.

Male: Similar to the female except for primary sex characters and having a 17-19 segmented antenna (usually 18).

Material Examined (7♀♀, 5♂♂)-- MISSISSIPPI: 3♀♀, IX-10-67 (F67-9-10j, FGA), 1 mi., N. Sanderville, Jones Co. TEXAS: 4♀♀, 5♂♂, IV-8-15 (PHT) Brownsville.

Aphid Hosts-- (see Appendix)

Known Distribution-- Florida

New Distribution-- Mississippi and Texas

Habitat Information-- this parasite is little known but its distribution in southern USA appears to be associated with Solidago and Parthenium.

Aphidius gifuensis Ashmead

Aphidius gifuensis Ashmead, 1906: 188. Stary & Schlinger, 1967: 17 (host). Takada 1968: 97 (host).

This species is characterized by a long metacarpus, a long 2nd abscissa, and a 17-segmented antenna. Based on its morphology it is related to A. matricariae but differs from it in

having more antennal segments and a more slender petiole.

~~Di~~agnosis-- Female: Specimen length 2.5 mm.; head thick, 1.5 as wide as long in dorsal view, occipital margin concave; face about as wide as 1/3 of head width as 11:30 and little wider than its height (as 11:10), eye convergent towards middle of face; tentoriocular line to intertentorial line as 2:5, clypeus half-shere shaped; antenna 17-segmented, 1st flagellar seg. 3.5 as long as wide; fore wing with stigma 3.7 as long as wide, metacarpus as long as stigmal length, 2nd abscissa subequal to 1st (fig. 87); propodeum with distinctly pentagonal areola (fig. 37); petiole slender, 3.5 as long as wide, rugose, posterior part swollen and 1/2 wider than anterior part (fig. 52); genitalia with basally broad ventral prong on 9th tergite and ovipositor sheath ventrally extended backwards (fig. 72); color, generally dark brown.

Male similar to the female except for primary sex characters and in having an 18-20 segmented antenna.

Material Examined (6♀♀)-- BRITISH COLUMBIA: 6♀♀, VII-14-60 (60-7-28o, EIS), Ocean Falls.

Aphid Hosts-- (see Appendix)

Known Distribution-- Formosa, Hawaii and Japan

New Distribution-- British Columbia, Canada

Habitat Information-- This species is widely distributed in the Oriental region from southern Formosa to northern Japan and parasitizes aphids in the genera Aphis, Aulacorthum, Macrosiphum and Myzus, in various habitats. In Formosa it appears to be an effective parasite of Myzus persicae.

Aphidius liriodendrii n. sp.

This parasite is characterized by a narrow face, an 18-segmented antenna, and a propodeum with a narrow areola. Morphologically it is closely related to A. nigripes and A. pisivorous. It differs from both species in having a broad ventral prong on the 9th tergite and by the shape of its ovipositor sheath.

Description-- Female: Specimen length 20 mm., antenna 1.7 mm., fore wing 1.8 mm.; head thick, about 1.6 as wide as long in dorsal view and 2.6 as wide as facial width in front view, temple convex, occipital margin almost straight, eye middle-sized and slightly convergent towards middle of face, clypeus convex, tentoriocular line equal to 1/2 of intertentorial line, gena about equal to 1/3 of longitudinal eye-diameter (fig. 14); antenna 18-segmented, 1st flagellar segment 4 times as long as wide.

Fore wing with narrow stigma, 4 times as long as wide, the ratio of metacarpus to stigmal length as 1:1.4, 1st abscissa as long as 1.5 of stigmal width or subequal to 1.5 of 2nd (fig. 101); propodeum with a narrow areola (fig. 33).

Petiole slender, 3.5 times as long as wide at spiracles (fig. 55); genitalia with broad ventral prong on 9th tergite and ovipositor sheath ventrally extended backwards (fig. 78).

Color, dark brown; head dark brown except for yellowed face, mouthparts and basal gena; antenna dark brown except for scape and pedicel yellowish brown; mesoscutum and scutellum dark brown; propodeum, metapleuron and pronotum yellowish brown; legs yellow;

tergite I yellowish brown and the following segments tinged with yellowish bands on intersegments; ovipositor sheath dark brown.

Male-- Unknown.

Types-- Holotype ♀, and 2♀♀ paratypes, Bancroft, Virginia, VII-11-31 (PHT), reared from Macrosiphum liriodendri on Liriodendron sp.

Mummified aphid-- Pale white.

Habitat Information-- This is a deciduous tree aphid parasite, whose host aphids are very abundant on the undersides of leaves of the tulip tree, Liriodendron tulipifera in eastern United States. The tulip tree is very commonly cultivated in California, and the aphid and/or the parasite may eventually invade California from eastern United States.

Aphidius lonicerae Marshall

Aphidius lonicerae Marshall, 1896: 572; Takada, 1968: 99.
Aphidius silvaticus Stary, 1962: 114.
Aphidius pulcher Baker, 1909: 24 (♀); Mackauer 1963: 931. New Synonym.

This species is characterized by a slender petiole, a narrow stigma, a narrow face and a 17-18 segmented antenna. Morphologically it is closely related to A pisivorous but differs from it in having a narrow face, a short metacarpus, a slender petiole, a fewer segmented antenna and relatively slender ovipositor sheath. Based on Mackauer's redescription of A. pulcher type, I believe A. pulcher is a synonym of A. lonicerae by the shorter metacarpus, the shorter abscissa and by a narrower face than in

A. pisivorous.

Diagnosis-- Female: Specimen length 3.2-3.6 mm.; head about equal to 2.8 of facial width, tentoriocular line about equal to 1/2 of intertentorial line; gena as wide as 1/3 of longitudinal eye-diameter; antenna 17-18 segmented, 1st flagellar seg. 3.5-4.0 as long as wide; fore wing with narrow stigma 4.2 as long as wide, metacarpus 1/3 shorter than stigmal length, 1st abscissa 1/3 longer than stigmal width (fig. 89); petiole slender, 3 times as long as wide at spiracles, parallel-sided and deeply depressed behind spiracles (fig. 53); genitalia with broad ventral prong on 9th tergite and relatively slender ovipositor sheath about 2.0-2.2 as long as wide at maximum (fig. 76); color, generally dark brown.

Male-- Similar to the female except primary sex characters and in having a 20-22 segmented antenna.

Material Examined (11♀♀, 12♂♂)-- BRITISH COLUMBIA: 1♀, VII-8-66 (P66-7-8a, PAR), 4 mi, S. E. Sineum; 8♀♀, 8♂♂, VII-6-66 (F66-7-6ej, FGA), Lac Lahache; 1♀, 3PP, VII-1-66, (F66-7-f, FGA), Forbidden Plateau, 2 mi., N. W. Courtenay; 1♀, VII-2-66 (F66-7-2e, FGA), Main & Forbidden. CALIFORNIA: 1♂, IV-28-73 (E73-4-28, EIS) Bates Canyon, Soquel, Santa Cruz Co.

Mummified aphid-- Immature aphid mummified in pale brown, adult aphid mummified in reddish brown.

Aphid Hosts-- (see Appendix)

Known Distribution-- Ireland, England, France, Denmark, Germany, Austria, Czechoslovakia, Hungary, Yugoslavia, U.S.S.R.

New Distribution-- British Columbia, California (see Map 3, #1)

Habitat Information-- This parasite occurs in association with the moist coniferous forests, and parasitizes aphids of the genera Amphorophora and Macrosiphum. In Europe it shows wide host preference and seems to be an important control agent of Macrosiphum aphids in forest undergrowth (Stary, 1966).

Aphidius lupini n. sp.

This species is characterized by having an 18-19 segmented antenna, a thick stigma, a slender petiole and an ovipositor sheath which extends strongly ventrally, caudally. It appears to be related to A. pisivorous but differs from it in having a thicker stigma, fewer antennal segments, and by the shape of the ovipositor sheath.

Description-- Female: Specimen length 2.7 mm., antenna 2.1 mm., fore wing 2.4 mm.; head thick, about 1.5 as wide as long in dorsal view and 2.4 as wide as facial width in front view, face 1.3 as wide as high; clypeus roundly triangular, its height to width as 3:4, tentoriocular line to intertentorial line as 1:2.3, gena to longitudinal eye-diameter as 1:3.6, eye convergent towards clypeus and its tranverse diameter 1/6 wider than temple (fig. 15); antenna 18-19 segmented (usually 18), 1st flagellar seg. 3.5 as long as wide.

Notaulices distinct on basal part and faint trace reaching posterior of mesoscutum; fore wing with fairly thick stigma, 3.3 as long as wide, metacarpus 1/3 shorter than stigmal length, 1st

abscissa 1/3 longer than stigmal width and as long as 1.2 of 2nd (fig. 94); propodeum with a narrow areola, the longitudinal carinae bifurcating near the transverse carinae.

Petiole slender, 4.0 as long as wide at spiracles, rugose on anterior portion, deeply depressed behind spiracles, with a narrow V-shaped carinae on basal part (fig. 42); genitalia with thumb-shaped ventral prong on 9th tergite, ovipositor sheath strongly extended backwards ventrally (fig. 94).

Color, dark brown; vertex and temple dark brown; face, mouthparts and gena yellowish-brown; antenna dark brown except for yellowed scape and pedicel; thorax dark brown except for yellowed pronotum and legs; abdomen yellow tinged with three dark brown bands on tergites II and III.

Male-- Similar to the female except for primary sex characters and in having a 21-22 segmented antenna.

Types-- Holotype ♀, Oxnard, Ventura Co., Calif., VII-4-58 (58-7-5e, JCH) reared from Macrosiphum albifrons on Lupinus sp. Paratypes (75♀♀, 68♂♂): 58♀♀, 65♂♂, Oxnard, Ventura Co., Calif. VII-4-58 (58-7-5e, JCH), 15♀♀, 2♂♂, VIII-10-62 (62-8-10h, EIS), reared from Macrosiphum albifrons on Lupinus sp.

Mummified aphid-- Pale brown

Distribution-- California (see Map 6, #2)

Habitat Information-- This is a common parasite and widely distributed throughout the known locality areas in Southern California. Based on the limited collecting records, it appears to be specific to M. albifrons on Lupinus species.

Aphidius masonaphis n. sp.

This species is characterized by a narrow stigma, a slender petiole and a stout ovipositor sheath. Morphologically it is related to A. rubifolii, but differs from it in having a narrower stigma and a more slender petiole.

Description-- Female: Specimen length 3.0 mm., antenna 2.7 mm.; head thick, 1.6 as wide as long in dorsal view and 2.7 as wide as facial width in front view, occipital margin almost straight; face narrow, little wider than its height as 14:11; eye rather prominent and convergent towards clypeus, tentoriocular line 1/3 as long as intertentorial line; clypeus dome-shaped, its length to width as 7:9, gena equal to 1/4 of longitudinal eye-diameter, temple 1/7 narrower than transverse eye-diameter; antenna 18-19 segmented, 1st flagellar seg. 3.6-3.8 as long as wide.

Notaulices distinct on basal part and somewhat depressed with trace reaching to posterior of mesoscutum; fore wing with narrow stigma, 5.0 as long as wide, metacarpus long and subequal to stigmal length, radius relatively long, 1st abscissa as long as 2 times stigmal width or subequal to 2nd as 6:5 (fig. 86); propodeum with a narrow pentagonal areola.

Petiole slender, 4.5-5.0 as long as wide at spiracles, rugose, moderately depressed behind spiracles and posterior portion slightly dilated (fig. 43); genitalia with thumb-shaped ventral prong on 9th tergite, ovipositor sheath stout and slanting posterioventrally (fig. 59).

Color, dark brown except face, clypeus and mouthparts

yellow; antenna with ventral side of scape and pedicel yellow: pronotum and legs yellow.

Male-- Similar to the female except for primary sex characters and in having a 21-22 segmented antenna.

Types-- Holotype ♀, Forbidden Plateau, British Columbia, Canada, VII-1-66 (P66-7-1f, PAR). Paratypes (1♀, 5♂♂)-- 1♀, 1♂, Topotypic. VII-1-66 (P66-7-1f, PAR) 1♂, VII-1-66 (F66-7-1d, FGA); 3♂♂, VII-6-66 (F66-7-6cg, FGA), Lac Lahache, Britich Columbia; reared from Masonaphis sp. on Ericacae.

Mummified aphid-- Pale brown aphid with long, slightly swollen cornicle, which is indistinctly imbricated.

Habitat Information-- This parasite occurs in the mixed evergreen forest which is associated with the moist coniferous forest in British Columbia.

Aphidius matricariae Haliday

Aphidius matricariae Haliday, 1834: 103. For complete synonymy see Stary (1966), except for A. phorodontis.

This species is characterized by a long metacarpus, a 14-15 segmented antenna, a stout petiole and a stout ovipositor sheath. Morphologically it is closely related to A. phorodontis but differs from it in having the clypeus distinctly lighter colored than its vertex, a thicker stigma, a 2nd abscissa longer than half of 1st and a relatively longer ovipositor sheath.

Diagnosis-- Female: Specimen length 1.7-2.3 mm., head 2.5 as wide as facial width in front view; antenna 14-15 segmented, 1st flagellar seg. 3.0 as long as wide; stigma 3.3 as long as

wide, metacarpus little longer than stigmal length as 10:11 (fig. 98); propodeum with a rather wide areola, longitudinal carinae on its upper part sometimes faint (fig. 30); petiole stout, 2.6 as long as wide at spiracles, and posterior portion dilated; genitalia with very broad ventral prong on 9th tergite and stout ovipositor sheath (fig. 71); color generally blackish-brown.

Male-- Similar to the female except for primary sex characters and in having a 17-19 segmented antenna.

Material Examined (100♀♀, 73♂♂)-- CALIFORNIA: 7♀♀, 3♂♂, IV-10-60 (60-4-10c, EIS), 7♀♀, 4♂♂, IV-25-60 (60-4-25c, EIS), 4♀♀, 9♂♂, III-24-60 (60-3-30h, B. Bowen), 1♀, 7♂♂, II-27-60 (E66-2-27c, EIS), 1♀, III-12-57 (D. Dunn), 2♀♀, 2♂♂, III-20-66 (E66-3-20a, EIS), Riverside, Riv. Co.; 29♀♀, 17♂♂, IV-24-58 (58-4-24, EIS) Wheeler Ridge, Kern Co.; 30♀♀, 24♂♂, II-23-12 (PHT) Whittier, Los Angeles Co.; 3♀♀, 1♂, V-5-59 (EIS), Culp Canyon, San Diego Co.; 6♀♀, 5♂♂, III-18-60 (60-3-24e, EIS), Highland Rd., San Diego, San Diego Co.; 1♀, IV-15-57 (EIS) Glendale, Los Angeles Co.; 1♀, II-15-61 (61-2-15g, K Arakawa), El Toro, Orange Co.

Aphid Hosts-- (see Appendix)

Known Distribution-- Europe, the Middle East, North Africa, Mongolia, Peru, Brazil, and North America (California, see Map 7). This species is native to the temperate zone of the Palearctic region and was (accidentally?) introduced into California (Schlinger & Mackauer, 1963).

Habitat Information-- This is a common and comparatively eurytopic species. About 40 species of aphids, belonging to 21 genera, were recorded as hosts of this species throughout the world (Schlinger & Mackauer, 1963). In California its main habitats appear to be in truck crops and garden areas where Myzus occur. It has also been found to parasitize the aphids Aphis gossipii and Aphis fabae when the species were associated with colonies of Myzus on the same host plant.

Aphidius montereyensis n. sp.

This species is characterized by a narrow stigma, a short metacarpus, a slender petiole and a stout ovipositor sheath. Morphologically it is related to both A. vaccinii and A. pisivorous. It differs from the former by the color and shape of the ovipositor sheath, while it differs from the latter in having fewer antennal segments and a slender petiole.

Description-- Female: Specimen length 2.4 mm., antenna 2.0 mm., fore wing 2.3 mm.; head moderately thick 1.6 as wide as long in dorsal view and 2.4 as wide as facial width in front view, occipital margin distinctly concave; face with nearly subequal to its height as 1:1.2; clypeal length to width as 5:7, tentorioocular line 1/2 as long as intertentorial line; gena subequal to 1/4 of longitudinal eye-diameter; transverse eye-diameter 1/6 wider than temple; antenna 18-segmented, 1st flagellar seg. 4.0 as long as wide.

Notaulices distinct only on basal part; fore wing with narrow stigma, 4.2 as long as wide, metacarpus to stigmal length as 1:1.8,

1st abscissa inserted near 1/3 of basal stigma, 1st abscissa 1.4 as long as stigmal width or 1/3 as long as 2nd (fig. 91); propodeum with narrow areola (fig. 36).

Petiole slender, 4.0 as long as wide at spiracles, rugose on basal and posterior part, spiracular tubercles faintly visible, petiole deeply depressed behind spiracles, posterior portion slightly dilated and 1/6 wider than basal part (fig. 51); genitalia with finger-shaped ventral prong on 9th tergite and stout ovipositor sheath (fig. 67).

Color, yellow except head generally brown except for three darker spots around occelli and yellowed face and mouthparts; antenna dark brown except for scape, pedicel and basal 1st flagellar segment yellowish-brown; thorax yellow, tinged with brown on mesoscutum; abdomen yellow with tinged brown bands on basal 1/2 part of 2nd and 3rd segments.

Male-- Unknown.

Types-- Holotype ♀, Alder Creek, Monterey Co. Calif. VII-7-62 (E62-8-7d, EIS) reared from Macrosiphum californicus on Salix sp.; Paratypes (2♀♀, 1♂); also, 1♀, 5-10 mi, E. Tillamook Hwy. 6 on Willson River, Tillamook Co., Oregon, VIII-21-66 (L66-8-21b, C. Lagace) reared from Macrosiphum californicus on Salix sp.

Distribution-- (see Map 6)

Habitat Information-- This parasite is associated with Salix sp. and has only been found in moist places along streams, and lakes near forest openings in California and Oregon.

Aphidius nigripes Ashmead

Aphidius nigripes Ashmead, 1901: 588; Gahan, 1911: 172 (host); Smith, 1944:60 (host).

This species is characterized by the black thorax and petiole; Morphologically it is related to A. pisivorous and A. gifuensis. It differs from the former in having fewer antennal segments, while it differs from the latter in having a shorter metacarpus.

Diagnosis-- Female: Specimen length 2.5 mm.; head thick, 1.5 as wide as long in dorsal view, occipital margin straight; face wider than its height as 1.3:1; tentoriocular line equal to 1/2 of intertentorial line; gena 0.4 as wide as longitudinal eye-diameter; transverse eye-diameter little wider than temple as 11:10; antenna 17-19 segmented (usually 18), 1st flagellar seg. 3.0 as long as wide; fore wing with narrow stigma, 4.3 as long as wide, metacarpus to stigmal length as 1:1.4, 2nd abscissa 1/6 shorter than 1st (fig. 90); propodeum with narrow and parallel pentagonal areola; petiole 3.4-3.7 as long as wide at spiracles, posterior portion little wider than anterior part, basal part rugose, deeply depressed behind spiracles and smoother on posterior part; genitalia with sharp ventral prong on 9th tergite, ovipositor sheath slightly narrowed backwards (fig. 83); color blackish-brown.

Male-- Similar to the female except for primary sex characters and in having a 19-21 segmented antenna.

Material Examined (10♀♀, 3♂♂)-- CALIFORNIA: 3♀♀, IV-15-73 (P. Matteson), Gill Tract, Albany, Alameda Co. MAINE: 7♀♀, 3♂♂,

VIII-?-52 (W. A. Shands), Aroostook Co.

Aphid Hosts-- (see Appendix)

Known Distribution-- Colorado, Maine, Maryland, Ohio, Connecticut, North Carolina, Michigan, Kansas, Minesota and California (see Map 3, #3)

Habitat Information-- This parasite is widely distributed in North America and occurs on cultivated plants such as sweet potatoes, rose, and Iris. In Berkeley, California during the spring, the species was very common on Iris sp. where it parasitized the aphid, Macrosiphum solanifolii.

Aphidius ohioensis Smith

Aphidius ohioensis Smith, 1944: 63

This species is characterized by a thick stigma, a short metacarpus and a 16-17 segmented antenna. Morphologically it is closely related to A. alius, but differs from it in having more antennal segments, more effaced longitudinal carinae on anterior part of propodeum, and by its host complex.

Diagnosis-- Female: Specimen length 2.0-2.6 mm., head 2.5 as wide as facial width, gena 1/3 as wide as longitudinal eye-diameter, tentoriocular line 2/3 as long as intertentorial line; antenna 16-17 segmented, 1st flagellar seg. 3.0 as long as wide; fore wing with thick stigma, 3.0 as long as wide, metacarpus to stigmal length as 2:3, 2nd abscissa shorter than 1st, as 1:2.4 (fig. 99); propodeum with effaced longitudinal carinae on upper part; petiole 3.0 as long as wide at spiracles, posterior portion dilated and 1/3 wider than anterior portion; genitalia with broad

ventral prong on 9th tergiet and relatively broad ovipositor sheath about 1.8 as long as wide at maximum (fig. 70); color generally yellowish-testaceous to piceous.

Male-- Similar to the female except for primary sex characters and in having a 19-segmented antenna.

Material Examined (32♀♀, 33♂♂)-- ARKANSAS: 1♀, IX-12-67 (C67-9-12c, D. Calvert) 2mi., W. Marked Tree, Hwy 63, Pointsett Co. BRITISH COLUMBIA: 2♀♀, 4♂♂, VI-2-57 (EIS) Skihist Camp; 2♀♀, VII-4-66 (F66-7-4h, FGA), 2mi., S. Spences. CALIFORNIA: 6♀♀, 3♂♂, X-25-65 (65-5-25, M. E. Irwin), 3♀♀, IV-22-60 (E60-4-20d, EIS), 3♀♀, 3♂♂, III-15-61 (61-3-15b, PHT), Riverside, Riv. Co.; 1♂, VII-1-63 (EIS), Tucalota Creek; 7♀♀, 1♂, VII-3-61 (61-7-3a, RVB), Lake Wahlford, San Diego Co.; 10♀♀, 7♂♂, VII-5-61 (61-7-6b, EIS), Santa Paula, Ventura Co. MISSISSIPPI: 6♂♂, IX-10-67 (F67-9-10g, FGA), 1 mi., N. Sandersville, Jones Co. UTAH: 12♀♀, 21♂♂, III-13-13 (PHT), Murray; 3♀♀, 2♂♂, VIII-10-13 (PHT), Salt-lake.

Aphid Hosts-- (see Appendix)

Known Distribution-- Arizona, Arkansas, Ohio, Tennessee, Maine, Kansas, and New Brunswick, British Columbia, Canada.

New Distribution-- California (see Map 8, #1), Mississippi and Utah.

Habitat Information-- This species is widely distributed in oak-chaparral areas, and usually parasitizes Dactynotus species on Compositae.

Aphidius phorodontis Ashmead

Aphidius phorodontis Ashmead, 1888: 662.

This parasite is characterized by its small size, a long metacarpus, and a stout ovipositor sheath. Morphologically it is related to A. matricariae but differs from it in having the clypeus of the female usually browned and concolorous with vertex, a shorter 2nd abscissa, and a relatively more stout ovipositor sheath.

Diagnosis-- Female: Specimen length 1.5 mm.; head 2.3 as wide as facial width in front view, tentorioocular line about 2/3 as long as intertentorial line, clypeus somewhat triangular and 2 times as wide as high, gena 1/3 as wide as longitudinal eye-diameter; antenna 14-segmented, 1st flagellar seg. 3.0 as long as wide; fore wing with stigma 3.4 as long as wide, metacarpus to stigmal length as 10:11, 2nd abscissa 1/2 as long as 1st (fig. 108); propodeum with narrow areola on lower part; petiole stout, 2.5 as long as wide at spiracles; genitalia with broad ventral prong on 9th tergite, and with stout ovipositor sheath clothed with sparse, long hairs (fig. 57); color brown, except for yellowish-brown legs and tergites.

Male-- Similar to the female except for primary sex characters and in having a 17-segmented antenna.

Material Examined-- CALIFORNIA: 1♀♀, 4♂♂, III-2-58 (58-3-3a, JCH), Riverside, Riv. Co.

Aphid Hosts-- (see Appendix)

Known Distribution-- Maryland and Ottawa, Canada

New Distribution-- California (see Map 8, #2).

Habitat Information-- This species is widely distributed, but rare in California where it parasitizes Phorodon menthae, a specific aphid, on Mentha species in southern California.

Aphidius pisivorous Smith

Aphidius pisivorous Smith 1941: 537; Smith, 1944: 65 (redescription, host).

This species is characterized by a narrow stigma, a stout and dilated petiole and a stout ovipositor sheath. Based on venation it is related to A. lonicerae, but differs from it in having a wider face, a stout petiole and a stout ovipositor sheath.

Diagnosis-- Female: Specimen length 3.0-3.5 mm.; head 2.2 as wide as facial width (fig. 10), tentoriocular line 1/3 as long as intertentorial line, gena to longitudinal eye-diameter as 1:3.5; antenna usually 20-segmented, 1st flagellar seg. 4.0 as long as wide; fore wing with narrow stigma 4.0 as long as wide; metacarpus to stigmal length as 1:1.2, 2nd abscissa subequal to 1st as 5:6 (fig. 115); propodeum with close and parallel longitudinal carinae on lower protion; petiole rugose, stout, 2.5 as long as wide at spiracles, posterior portion rather dilated and 1/3 wider than anterior portion (fig. 39); genitalia with finger-shaped ventral prong on 9th tergite, with stout ovipositor sheath a little broader on anterior portion (fig. 81); color, mostly dark brown.

Male-- Similar to the female except for primary sex char-

acters and in having a 20-22 segmented antenna.

Material Examined (5♀♀, 2♂♂)-- BRITISH COLUMBIA: 2♀♀, VII-6-66 (V66-7-6c, VDB), La Lahache; 1♂, VII-8-66 (P66-7-8h PAR), 4 mi., S. E. Cinema. CALIFORNIA: 2♀♀, XI-10-60 (60-11-10d, JCH), Riverside, Riv. Co.; 1♀, IX-11-57 (57-9-11, EIS), Cawello, Kern Co.; 1♂, IV-21-60 (60-4-21, EIS) Lancaster, Los Angeles Co.

Aphid Hosts-- (see Appendix)

Known Distribution-- California, Idaho, Maine, Nevada, Ohio, Oregon, Utah, Virginia, Washington, D.C., and New Brunswick and British Columbia, Canada (see Map 6, #4 for California).

Habitat Information-- This is not an uncommon parasite. It is found parasitizing acyrthosiphum pisum, in California, on host plants in agricultural areas such as Tribolium, Medicago, Lathyrus, Pisum, Vicia and Melilotus species.

Aphidius polygonaphis (Fitch)

Praon polygonaphis Fitch, 1856: 136.

Aphidius polygonaphis (Fitch) 1911: 178. For complete synonymy see Smith (1944).

Aphidius funebris Mackauer; Takada, 1968: 102 (Japan), New Synonym.

This parasite is characterized by a broad face, an 18-segmented antenna, its 1st and 2nd abscissa subequal in length, and a slender ovipositor sheath. Based on the venation and the genitalia it is closely related to A. absinthii and A. floridaensis, but it differs from the former in having a longer ovipositor

sheath, and from the latter in having a relatively longer 1st and 2nd abscissa.

Diagnosis-- Female: Specimen length 2.5-3:0 mm.; head broad, 2 times as wide as facial width in front view, tentoriocular line 2/3 as long as intertentorial line; antenna usually 18-segmented; fore wing with stigma 3 times as long as wide, metacarpus to stigmal length as 1:1.2; 1st abscissa 1/4 longer than stigmal width and about equal to 2nd abs. (fig. 95); propodeum with narrow pentagonal areola, usually with faint longitudinal carinae (fig. 34); petiole stout, 2.5 as long as wide at spiracles, rugose on basal part, sometimes with distinct spiracular tubercles; genitalia with broad ventral prong on 9th tergite, and slender, slightly upwardly curved ovipositor sheath (fig. 62); color, mostly yellowish-brown to brown.

Male-- Similar to the female except for primary sex characters and in having a 19-20 segmented antenna.

Material Examined (9♀♀, 10♂♂)-- ARKANSAS: 6♀♀, 9♂♂, IX-12-67 (F67-9-12d, FGA), 2 mi., W. Marked Tree, Poinsett Co.; 3♀♀, 1♂, IX-12-67 (F67-9-12g, FGA), Lanieue, Craghead Co.

Aphid Hosts-- (see Appendix)

Known Distribution-- France, Denmark, Germany, Czechoslovakia, Hungary Bulgaria, U.S.S.R., Algeria and North America (Florida, Ohio, Virginia, Utah, Mississippi and Louisiana)

New Distribution-- Arkansas

Habitat Information-- It is a common and widely distributed species in eastern North America, which usually parasitizes

Dactynotus species on weedy Compositae.

Aphidius pteridis n. sp.

This species is characterized by a narrow face, an 18-segmented antenna and an ovipositor sheath with a tubercle-like protuberance on the upper edge of the basal part. Morphologically it is related to A. lupini n. sp. and A. pisivorous, but differs from both species by venation and ovipositor sheath characters.

Description-- Female: Specimen length 2.5 mm., antenna 1.9 mm., fore wing 2.2 mm.; head fairly transverse 1.7 as wide as long in dorsal view and 3 times as wide as facial width in front view (fig. 11); temple much narrower than transverse eye-diameter as 2:7; occipital margin shallowly concave; face narrow, 1/4 as wide as facial height, tentoriocular line 1/3 as wide as intertentorial line; clypeus roundly convex; gena as wide as 1/4 of longitudinal eye-diameter; antenna 18-segmented, 1st flagellar seg. 4 times as long as wide.

Mesoscutum nearly vertically falling on pronotum, scutellum fairly convex; notaulices distinct on basal part; propodeum with faint longitudinal carinae on upper part (fig. 25); fore wing with stigma 3 times as long as wide, metacarpus short and 1/2 as long as stigmal length, 1st and 2nd abscissa about subequal in length (fig. 93).

Petiole slender, 3.5 as long as wide at spiracles, deeply depressed behind spiracles, posterior portion dilated and half again as wide as anterior part at spiracles (fig. 44); genitalia with large ventral prong on 9th tergite, ovipositor sheath with

tubercle-like protuberance on upper edge of basal part (fig. 61).

Color, dark brown; head dark brown except for yellowed face and mouthparts; antenna dark brown except for scape, pedicel and basal 1st flagellar segment yellowish-brown; mesoscutum, scutellum, propodeum and ventral part of mesopleuron dark brown, other parts testaceous; legs yellow; abdomen dark brown except for yellowed 1st tergite and intersegmental areas.

Male-- Similar to the female except for primary sex characters and in having a 20-segmented antenna.

Types-- Holotype 1♀, Fern Valley, San Jacinto Mts., Riverside Co., Calif., VIII-26-65 (E65-VIII-26a, EIS); Paratypes 4♂♂, 9 mi., S. Medeary, Thurston Co., Washington VI-25-66 (F66-6-25a, FGA). Both paratypes and holotype were reared from Macrosiphum pteridis on Pteridium sp.

Mummified Aphid-- Whitish-brown

Distribution-- (see Map 6, #5).

Habitat Information-- This rarely encountered species parasitizes an aphid, Macrosiphum pteridis, which has been commonly collected feeding on the undersides of the leaves of Bracken fern, Pteridium aquilinum in moist forest undergrowth areas. According to E. I. Schlinger (pers. comm.) each of the many aphid colonies collected were reared from parasites and the reason for the infrequent parasite occurrence is unknown.

Aphidius ribis Haliday

Aphidius ribis Haliday, 1834: 101. Ashmead, 1901: 167. Gahan, 1911: 181 (host). Smith, 1944: 70 (host).

Lysiphlebus ribaphidis Ashmead, 1888: 664.

This species is easily distinguished by having a wide propodeal areola, a 15-segmented antenna, and a slender ovipositor sheath. Morphologically it is related to A. amelanchieri n. sp. A. kakimiaphidis sp. but differs from both species by genitalic and propodeal characters.

Diagnosis-- Female: Specimen length 2.0-2.5 mm.; head 2.4 as wide as facial width, tentoriocular line 1/3 as long as intertentorial line, gena 1/4 as wide as longitudinal eye-diameter; antenna 15-segmented, 1st flagellar segment 3 times as long as wide; fore wing with stigma 3.5 as long as wide, metacarpus long and subequal to stigmal length as 1:1.2, 1st abscissa slightly curved, 2nd abscissa distinctly shorter than 1st as 7:10 (fig. 105); propodeum with a wide pentagonal areola (fig. 31); petiole stout, 2.5 times as long as wide at spiracles, posterior portion dilated and 1/3 wider than anterior portion; genitalia with slender ovipositor sheath (fig. 58); color yellowish-brown to dark brown.

Male-- Similar to the female except for primary sex characters and in having a 17-18 segmented antenna.

Material Examined-- BRITISH COLUMBIA: 1♀, 1♂, VI-4-57 (57-6-4, EIS), Vancouver Is.

Aphid Hosts-- (see Appendix)

Known Distribution-- Ontario, Canada to Washington, D.C. and west to Iowa and Utah; New Brunswick; Manitoba and British Columbia. (Schlinger & Hall, 1960).

Habitat Information-- This parasite is widely distributed in boreal North America. It has been found occurring in foothill areas with Cryptomyzus ribis (L.), but since this aphid has alternative plant hosts in the summer and winter, this parasite may have a wide host preference and other habitats.

Aphidius rosae Haliday

Aphidius rosae Haliday, 1833:261.

Aphidius confusus Ashmead, 1888:662 (♂). new synonym. For complete synonymy see Smith (1944).

This species is characterized by a subequal length of 1st and 2nd abscissa, a propodeum with a pentagonal areola and a 17-18 segmented antenna. Morphologically it is related to A. nigripes, but differs from it in having a yellow thorax and by tergite I. Based on Smith's redescription of A. confusus I believe A. confusus is a synonym of A. rosae by the venation, the petiole and the host of Macrosiphum euphorbiae.

Diagnosis-- Female: Specimen length 2.5-3.2 mm.; head as wide as 2.7 of face, intertentorial line 2.5 as long as tentoriocular line, gena as long as 1/4 of longitudinal eye-diameter; antenna 17-18 segmented, 1st flag. seg. 4 times as long as wide; fore wing with stigma narrow, 4 times as long as wide, metacarpus subequal to stigma as 1:1.2, 1st and 2nd abs. subequal in length (fig. 106); propodeum with pentagonal areola, petiole 3.3 as long as wide at spiracles, posterior portion slightly dilated; genitalia with slender ventral prong on 9th tergite, ovipositor sheath 2 times as long as wide at maximum (fig. 69); color, yellow.

Male: Similar to the female except primary sex characters and in having a 20-21 segmented antenna.

Material Examined (8♀♀, 2♂♂)-- CALIFORNIA: 2♀♀, Bishop, Inyo Co.,

VI-16-61 (61-6-16a, RVB); 6♀♀, 2♂♂, Santa Ana., Orange Co., III-16-62 (62-3-16c, R.C.Dickson).

Aphid Hosts (see Appendix)

Known Distribution-- Holarctic (Mackauer & Starý 1967), California (see Map 9).

Habitat Information-- This is a widely distributed species and mainly parasitizes M. euphorbiae on various hosts in California.

Aphidius salicis Haliday

Aphidius salicis Haliday, 1834: 102 (♀,♂). For complete synonymy see Mackauer & Starý (1967), except for A. dauci.

This species is characterized by a short antenna, a wide face, a wide gena, a short metacarpus, and a broad ovipositor sheath. Morphologically it is closely related to A. dauci but differs from it in having fewer antennal segments, a smaller body size, a wider face, a shorter metacarpus and a relatively more stout ovipositor sheath.

Diagnosis-- Female: Specimen length 1.5-1.9 mm.; head 2.2 as wide as face, tentoriocular line 1/2 as long as intertentorial line, gena to longitudinal eye-diameter 1:2.5; antenna 13-segmented, 1st flag. seg. 2.5-3.0 as long as wide; fore wing with stigma 4.5 as long as wide, metacarpus subequal to 1/2 of stigma as 5:9 (fig. 109); propodeum with a complete areola; petiole 3.5 as long as wide at spiracles, posterior portion slightly dilated; genitalia with broad ventral prong on 9th tergite and stout ovipositor sheath (fig. 63); color, dark brown.

Male-- Similar to the female except for primary sex characters and in having a 15-17 segmented antenna.

Material Examined (56♀♀, 52♂♂)-- CALIFORNIA: 35♀♀, 22♂♂, IV-14-60 (60-4-15d, JCH), Santa Barbara; 18♀♀, 26♂♂, VIII-4-60 (60-8-4, JCH), Camarillo, Ventura Co.; 3♀♀, 4♂♂, VI-16-63 (63-6-16, EIS), Cajon Pass, San Bernadino Co.

Aphid Hosts-- (see Appendix)

Known Distribution-- Holarctic Region and Australia (see Mackauer & Stary (1967) for detailed data).

Habitat Information-- This is a common parasite of Cavariella aegopodii which feeds on the tender shoots and leaves of willows in the spring, and then migrates to various species of Umbelliferae in early summer. C. aegopodii is more common than another host species, C. pastinacae, in California, which is also found on Umbelliferae in summer, but which passes the fall, winter and spring on Lonicera.

Aphidius smithi Sharma & Rao

Aphidius smithi Sharma & Rao, 1959: 181.

This species is characterized by having a propodeum which is distinctly darker brown than the mesopleuron and pronotum, a 19-20 segmented antenna, an ovipositor sheath which strongly extends backwards ventrally, and a petiole which is dilated posteriorly. Morphologically it is related to A. pisivorous but differs from it by the characters of color and wing venation.

Diagnosis-- Female: Specimen length 2.8-3.5 mm.; head 2.5 as wide as facial width; clypeus broad, length to height as 13:7, tentoriocular line 1/3 as wide as intertentorial line, gena 1/4 as long as longitudinal eye-diameter; antenna 19-20 segmented,

1st flagellar segment 3.5 as long as wide; fore wing with stigma 3.3 as long as wide, metacarpus to stigmal length 1:1.6, 2nd abscissa subequal to 1st as 10:11 (fig. 88); propodeum with a pentagonal areola; petiole 3 times as long as wide at spiracles, spiracular tubercles distinct, posterior portion 1/3 wider than anterior portion (fig. 40); genitalia with thumb-shaped ventral prong on 9th tergite and ovipositor sheath strongly extended backwards ventrally (fig. 84); color, thorax yellowish to reddish-brown, but propodeum, metascutum and scutellum dark brown.

Male-- Similar to the female except for primary sex characters, darker color, and in having a 22-23 segmented antenna.

Material Examined (107♀♀, 47♂♂)-- CALIFORNIA: 4♀♀, 7♂♂, IV-21-60 (60-4-21b, JCH), Daggett, San Bernadino Co.; 3♀♀, IV-21-60 (EIS), Antelope Valley, Los Angeles Co.; 7♀♀, 1♂, IV-21-60 (JCH) Hinkley, San Bernardino Co.; 3♀♀, 2♂♂, X-6-60 (JCH), Bishop, Inyo Co.; 4♀♀, III-24-60 (EIS), Winterhaven, Imperial Co.; 2♀♀, 1♂, IV-14-60 (EIS), Agoura, Los Angeles Co.; 26♀♀, 18♂♂, VI-26-59 (JCH), Milpitas, Santa Clara Co.; 4♀♀, III-29-69 (EIS), 4 mi., W. Seeley, Imperial Co.; 6 ♀♀, 1♂, III-10-60 (EIS), Lakeside, San Diego Co.; 1♀, III-15-60 (EIS), Blythe, Riverside Co.; 3♀♀, III-22-60 (EIS), Newberry Park, Ventura Co.; 2♀♀, III-24-60 (EIS), Imperial Irrigation Farm, Imperial Co.; 1♀, III-8-60 (EIS), 6 mi., W. El Centro, Imperial Co.; 5♀♀, 1♂, III-8-60 (EIS), 8 mi., NW. Westmoreland, Imperial Co; 3♀♀, III-8-60 (EIS), 1 mi., E. Imperial Co.; 1♀, III-31-60 (EIS), Llano, Los Angeles Co.; 3♀♀, III-10-60 (EIS), Tijuana Vly, San Diego Co.; 3♀♀, 3♂♂, II-17-66 (R. C.

Dickson), W. Indio, Riverside Co.; 2♀♀, 1♂, X-2-63 (D. K. Hunter); 1♀, IV-8-60 (60-4-8c, EIS), 6♀♀, XI-10-60 (60-11-10c, JCH), Riverside, Riv. Co.; 1♀, IV-14-73 (EIS), Alpine Lake, Liberty Gulch, Marin Co.; 2♀♀, 1♂, III-31-60 (60-3-31a, EIS), Buelton; 3♀♀, IV-15-66 (66-4-15b, JCH), 1♀, IV-20-62 (E. J. Dietrick), Oxnard, Ventura Co.; 1♂, VII-7-62 (EIS), Willow Creek, Monterey Co.; 2♀♀, V-18-72 (EIS) Kelsey Cabin Area, Hopland, Mendocino Co.; 7♀♀, 10♂♂, IV-29a, EIS), Temecula Can. Santa Margarita River, San Diego Co. COLORADO: 2♀♀, 1♂, IX-18-67 (C67-9-18f, D. Calvert), 2 mi., NW. Chimney Rock, Archuleta Co.

Aphid Hosts-- (see Appendix)

Known Distribution-- India and North America, introduced into California (see Map 11)

Habitat Information-- This introduced parasite is usually found near their parasitized aphids of Acyrthosiphon pisum, which are commonly found mummified on the leaves or the stems of Medicago. They are also found attacking this aphid on Tribolium Lathyrus, Pisium, Vicia, Melilotus and several thistles. Further references to the introduction, biology, biological control and ecology of this important parasite are: Hager & Schlinger (1960: 5), Van den Bosch, et al. (1960: 1049-1055), Wiakowsky (1962: 253).

Aphidius vaccinii n. sp.

This species is characterized by a narrow stigma, a slender petiole, a narrow propodeal areola and a stout ovipositor sheath. Morphologically it is related to A. masonaphis n. sp. and A. mon-

tereyensis n. sp. It differs from the former in having a relatively short radius and a short metacarpus. It differs from the latter in having the ovipositor sheath strongly extended backwards ventrally, and a narrower and sharper ventral prong on the 9th tergite.

Description-- Female: Specimen length 3 mm., antenna 2.9 mm., fore wing 2.3 mm.; head thick 1.8 as wide as long in dorsal view and 2.5 as wide as facial width in front view, temple convex and occipital margin straight in dorsal view; face 1.3 as wide as its height, tentoriocular line 1 ? as long as intertentorial line, gena to longitudinal eye-diameter as 1:35, temple 1/6 wider than transverse eye-diameter; antenna 18-segmented, 1st flagellar segment 4 times as long as wide.

Notaulices distinct on basal part, rather visibly depressed, but trace reaching posteriorly 2/3 back on mesoscutum; fore wing with stigma 4.4 as long as wide, metacarpus 2/3 as long as stigmal length, 1st and 2nd abscissa relatively short, 1st abscissa 1.5 as long as stigmal width and 1.4 as long as 2nd abs. (fig. 92); propodeum with a narrow central areola.

Petiole slender, 4 times as long as wide at spiracles, with two distinct carinae on lateral anterior portion, and deeply depressed behind spiracles (fig. 41); genitalia with narrow and sharp ventral prong on 9th tergite, stout ovipositor sheath strongly extended backwards ventrally (fig. 56).

Color, dark brown; head dark brown except for yellowed mouthparts and face; antenna dark brown except for scape, pedicel

and basal 1st flagellar seg., yellowish-brown; thorax dark brown; legs yellow; abdomen dark brown except for intersegmental areas of 2nd and 3rd tergites, yellowish-brown.

Male-- Similar to the female except for primary sex characters and in having a 22-segmented antenna.

Types-- Holotype ♀ and Paratype 1♀, 1♂, Forbidden Plateau, Vancouver Is., British Columbia, Canada, VII-1-66 (C66-VII-1d, D. Calvert), reared from Masonaphis sp. on Vaccinium sp.

Mummified aphid-- Dark brown.

Habitat Information-- This parasite is distributed in the mixed evergreen forest, associated with the moist coniferous forest in British Columbia.

APPENDIX

The species of Aphidius and their aphid hosts, known or possibly occurring in California.

1. +Aphidius absinthii Marshall

    +*Macrosiphoniella ludovicianae (Oestlund) on Artemisia douglasiana (60-3-30)@, Artemisia vulgaris (E66-4-29f) and Artemisia sp. (E66-3-13e)

    *Macrosiphum sp. on Chrysanthemum sp.

2. Aphidius alius Muesebeck

    *Amphorophora nervata (Gill.) on Arctostaphayloss sp. (59-5-29a)

    *Macrosiphum solanifolii (Ashmead) on Rosa sp. (E61-2-13b)

    Macrosiphum rosae (L.) on Rosa sp. (E58-3-24c)

    +*Myzus porosus Sanderson on Rosa sp. (E58-4-24a, E60-4-10b, 60-3-30a, E62-4-9a)

    Wahlgreniella nervata (Gill.) on Rosa sp. (G66-7-4a)

3. +Aphidius amelanchieri n. sp.

    *Acyrthosiphon macrosiphum (Wilson) on Amelanchier alnifolia (E62-8-8d) and Amelanchier sp (C66-7-3a, F66-7-2a)

---

* new host record
+ preferred host
\+ new California record

@ These numbers refer to original lot rearing numbers. The card lot numbers are available for study in the Entomology Museum, Univ. of Calif., Berkeley through E.I. Schlinger.

4. +Aphidius amphorophori n. sp.

*Amphorophora sp. on Epilobium angustifolium (61-3-1a)

*Amphorophora sp. on Rubus loganobaccus (E66-3-13c)

5. +Aphidius areolatus Ashmead

*Periphyllus californiensis (Shinji) on Acer palmatum

6. Aphidius asteris Ashmead (a species group)

*Amphorophora nervata (Gill.) on Rosa sp. (62-12-31a, 60-7-28g)

*Dactynotus ambrosiae (Thomas) on Anthemis cotula (66-8-23m), Artemisia sp., Baccharis viminea and Baccharis sp. (60-3-13a)

*Dactynotus baccharidis Clarke on Baccharis sp., Heterotheca grandiflora (E61-9-19b, E61-7-6b) and Heterotheca sp.

*Dactynotus erigeronensis (Thomas) on Baccharis sp. (61-3-16c), Conyza strigosus and Grindelia sp. (P66-7-1a)

+*Dactynotus katonkae (Hottes) on Artemisia tridentata (F66-7-4c,i)

*Dactynotus longirostris (G & P) on Cirsium sp. (F66-7-4s, P66-7-4b, 59-5-22, F66-7-4x, P66-7-4b) and Encelia sp. (60-3-15e)

*Dactynotus rudbeckiae (Fitch) on Baccharis sp. (59-4-10a), Calendula sp. (E59-4-30) and Encelia sp. (E64-2-9)

Macrosiphum sibiricum (Mordvilko) on Encelia sp. (60-4-14a)

Macrosiphum rosae (L.) on Rosa sp. (60-4-17b)

Macrosiphum sp. on Haplopappus venetus (E62-8-6d)

7. Aphidius avenae Haliday (A. obscuripes Ashmead)

Macrosiphum granarius Kirby (known only from eastern North America)

8. Aphidius avenaphis (Fitch)

∓**Macrosiphum avenae (Fabr.) on Elymus sp. (C66-7-1a)

Macrosiphum granarius on Triticum sp.

Myzus persicae (Sulzer) (?)

9. Aphidius berberidis Smith

Rhopalosiphum berberidis (Kalt.)(known only from Ohio)

10. Aphidius cingulatus Ruthe

∓Pterocomma bicolor (Oestlund) on Salix sp. (E61-7-6f, 61-6-29c)

*Pterocomma populifoliae (Fitch) on Salix sp.

*Pterocomma pseudopopulea Palmer on Populus sp. and Salix sp. (P66-7-1b)

Pterocomma smithiae (Monell) on Salix sp.

11. Aphidius dauci Marshall

*Cavariella pastinacae (L.) on Heracleum lanatum (P66-6-26a, C66-4-26a)

12. +Aphidius delicatus Baker

*Macrosiphoneilla ludovicianae (Oestlund) on Artemisia Dracunculus (58-7-29a)

13. Aphidius floridaensis Smith

∓Dactynotus ambrosiae (Thomas) on Solidago sp. (F67-9-10j)

Macrosiphum sp. on Parthenium sp.

Aphidius gifuensis Ashmead

*Myzus solani (Kalt.) on Ranunculus sp. (E60-7-28o)

Aphidius kakimiaphidis Smith

Kakimia cerei G. & P. (known only from Colorado)

Aphidius liriodendrii n. sp.

*Macrosiphum liriodendri (Monell) on Liriodendron sp.

+Aphidius lonicerae Marshall

*Acyrthosiphon sp. on Lathyrus sp.

+**Amphorophora brevitarsis G. & P. on Clematis sp. (F66-7-6j)

*Macrosiphum pelargonii (Kalt.) on Oxalis oregana (E73-4-28)

Macrosiphum valerianae (Clark) (?) on Epilobium sp. (P66-7-8a)

Masonaphis spiraeae MacGill. on Spirea sp. (F66-7-2e)

Masonaphis sp. on Epilobium angustifolium (F66-7-6e)

+Aphidius lupini n. sp.

*Macrosiphum albifrons Essig on Lupinus sp. (E62-8-10h, E58-8-5e)

Aphidius masonaphis n. sp.

*Macrosiphum aetheocornum S. & K. on Ericaceae (P66-7-6c, F66-7-6g)

*Masonaphis sp. on Ericaceae (P66-7-1f, F66-7-1d)

Aphidius matricariae Haliday

*Aphis fabae Scopoli on Nasturtium sp. (60-3-24e)

Aphis gossypii Glover on Cotyledon sp. (60-4-10c)

*Aphis helianthi Mon. on Pittosporum tobira

Aphis rumicis L. on Rumex crispsus

Brachycaudus helichrysi (Kalt.)

Macrosiphum rudbeckiae (Fitch) on Calendula officinalis

Macrosiphum sanborni Gill.

+Myzus persicae (Sulzer) on Achillea filipendulina, Capsium sp., Carthamus tinetorius, Datura stromonium, Malva parviflora (61-2-15g), Nasturtium sp. (60-4-10c), Pelargonium sp., (E66-3-20a), Viburnum suspensum, Urtica urens and Solanum Pseudo-Capsicum (E66-2-27c)

Myzus sp. on Avena sp. and Pelargonium sp.

Rhopalosiphum rufomaculatum (Wilson)

21. +Aphidius montereyensis n. sp.

*Macrosiphum californicum (Clark) on Salix sp. (E62-8-7d), L66-8-21b)

22. Aphidius nigripes Ashmead

Acyrthosiphon pisum (Kalt.)

Macrosiphum liriodendri (Monell)

Macrosiphum avenae (Fabr.) on Elymus sp.

+Macrosiphum solanifolii (Ashmead) on Iris sp.

Macrosiphum rosae (L.)

Myzus persicae (Sulzer) on Malva parviflora (?)

23. Aphidius ohioensis Smith

*Dactynotus ambrosiae (Thomas) on Baccharis sp. (65-5-25, 61-7-3a)

+Dactynotus baccharis (Clark) on Heterotheca grandiflora

(61-7-7b) and Gnaphalium beneolens (61-3-15b)

Dactynotus rudbeckiae (Fitch) on Ambrosia artemisifolia (E60-4-22d)

*Dactynotus sp. on Erigeron canadaensis (F66-7-4h

Macrosiphum anomalae H. & F.

Macrosiphum illini H. & F.

Macrosiphum sp. on Compositae (F67-9-10g)

24. +Aphidius phorodontis Ashmead

Phorodon manaleb Monell

+*Phorodon menthae (Buckton) on Mentha arvensis (58-3-3a)

Rhopalosiphum dianthi Schr. (?)

25. Aphidius pisivorous Smith

Acyrthosiphon pisum on Lathyrus sp. (V66-7-6c, P66-7-8h), Medicago sativa and Melilotus alba (60-11-10d)

26. +Aphidius polygonaphis (Fitch)

Dactynotus ambrosiae (Thomas) on Ambrosia sp., Anthemis cotula and Solidago sp. (F67-9-12d)

Dactynotus rudbeckiae (Fitch)

Macrosiphum taraxaci (Kalt.)

27. +Aphidius pteridis n. sp.

*Macrosiphum pteridis Willson on Pteridium aquilinum (65-7-26a) and Pteridium sp.

28. Aphidius ribis Haliday

Capitophorus ribis (L.) on Malva parviflora (E57-6-24c)

29. Aphidius rosae Haliday

Macrosiphum dirhodum (Walker)

Macrosiphum liriodendri (Monell)

†*Macrosiphum solanifolii (Ashmead) on Apocynum cannabium (V61-6-16h) Polystichum munitum (62-3-16c) and Rosa sp.

Macrosiphum rosae L. on Rosa sp.

30. Aphidius rubifolii Mackauer

Masonaphis maxima (Mason) on Rubus parviflorus (known only from British Columbia)

31. †Aphidius salicis Haliday

†*Cavariella aeqopodii (Scopoli) on Foeniculum vulgare (E60-4-15d) and Salix sp.

Cavariella sp. on Salix sp.

32. Aphidius smithi Sharma & Rao

†Acyrthosiphon pisum (Harris) on Medicago sativa (60-4-21b, 59-6-29a, 66-4-15b, 60-3-31a), Melilotus alba (60-11-10c), Melilotus sp. (E66-4-29a), Lathyrus sp., Trifolium sp. and on thistle

*Macrosiphum sp. on Encelia sp. (E60-4-8c)

*Myzus persicae (Sulzer) on Brassica sp. (?)

33. Aphidius vaccinii n. sp.

*Masonaphis sp. on Vaccinium sp. (C66-VII-1d)

Other distinct and apparently unnamed species of Aphidius and their hosts are:

34. Aphidius sp.

Aphis rosea (Baker) (known only from Camino, El Dorado Co., Calif.)

35. Aphidius sp.

Kakimia cynosbati (Oestlund) on Ribes aureum (?) (known only from Utah)

36. Aphidius sp.

Amphorophora morrisoni (Swain) on Arbutus menzesii (known only from Orinda Village, Contra Costa Co., Calif. E73-5-4)

37. Aphidius sp.

Aphid on Artemisia douglasiana (known only from Riverside, Calif.)

38. Aphidius sp.

Bornerina variabilis Rich. on Alnus sp. (F66-7-1e) (known only from British Columbia)

39. Aphidius sp.

Neomyzaphis abietina (Koch) on Picea sp. (60-7-28p) (known only from British Columbia)

40. Aphidius sp.

Cavariella sp. (?) on Castilleja sp. (known only from British Columbia)

41. Aphidius sp.

Pterocomma populifolii (Fitch) on Salix sp. (known only from Rock Creek Lake, Mono. Co., 9800 ft., Calif.)

The following parasite species are without available host records:

42. Aphidius atropetiolatus Ashmead (known only from Colorado)

43. Aphidius glacialis Ashmead (known only from Alaska)

44. Aphidius montanus Ashmead (known only from Colorado)

LITERATURE CITED

Ashmead, W. H.

1889. Descriptions of new Braconidae in the collection of the U.S. National Museum. Proc. U.S. Nat. Mus. 11:611-671.

1890. On the Hymenoptera of Colorado; descriptions of new species, notes, and a list of the species found in the state. Bull. Colo. Biol. Assoc. 1:1-47.

1901. Descriptions of five new parasitic Hymenoptera, In: Needham, J. G. & Betten, C., Aquatic insects in the Adirondacks. Bull. N.Y. St. Mus. 47:586-589.

1902. Papers from the Harriman Alaska Expedition. XXVIII. Hym. Proc. Wash. Acad. Sci. 4:117-274.

1906. Descriptions of new Hymenoptera from Japan. Proc. U.S. Nat. Mus. 30(1448):169-201.

Baker, C. F.

1909. Plant louse parasites 1 (Family Braconidae, Subfamily Aphidiinae). Pomona Coll. J. Ent. 1:22-25.

Beardsley, J. W.

1961. A review of the Hawaiian Braconidae (Hymenoptera). Proc. Hawaiian Ent. Soc. 17:333-366.

1962. Notes and Exhibitions: Aphidius gifuensis Ashmead. Hawaiian Ent. Soc. 18:10-11.

Cook, A. J.

1890. Aphidius granariaphis, n. sp. Can. Ent. 22:125-126.

Fitch, A.

1855. Report on the noxious, beneficial, and other insects, of the State of New York. C. van Benthuysen, Albany pp. 134-138.

1861. Sixth report on the noxious and other insects of the State of New York. Trans. agric. Soc. St. N.Y. 20: 839-340.

Gahan, A. B.

1911. Aphidiinae of North America. Bull. Md. Agric. Exp. Sta. 152:147-200.

1927. Some braconid and chalcid flies from Formosa, parasitic on aphids. Proc. U.S. Nat. Mus. 70(2657):1-7.

Hagen, K.S., Holloway, J.K., Skinner, F.E. and Finney, G.L.

1958. Aphid parasites established: Natural enemies of spotted alfalfa aphid brought from Middle East expected to be established throughout the state in 1958. Calif. Agric. 12(3):15.

Hagen, K.S. & Schlinger, E.I.

1960. Imported Indian parasite of pea aphid established in California. Calif. Agric. 14:5-6.

Haliday, A. H.

1834. Essay on the classification of parasitic Hymenoptera & c. Ent. Mag., London 2:93-106, 225-259.

Mackauer, M.

1961a. Die Typen der Unterfamilie Aphidiinae des Britischen Museums London (Hym.: Braconidae). Beitr. Ent. 11:96-154.

1961b. Neue europäische Blattlaus-Schlupfwespen (Hym.: Aphidiidae). Boll. Lab. Ent. Agr. Filippo Silvestri 19:270-290.

1961c. Die Gattungen der Familie Aphidiidae und ihre verwandtschaftliche Zuordnung (Hym.:Ichneumonoidea). Beitr. Ent. 11:792-803.

1962a. Spezifische Parasiten der Acyrthosiphon-Macrosiphum Gruppe und Grundfragen der Wirtsbindung der Blattlaus-Schlupfwespen (Homoptera:Aphididae; Hymenoptera:Aphidiidae). Z. angew. Ent. 50:125-131.

1962b. Blattlaus-Schlupfwespen der Sammlung F. P. Müller, Rostock (Hym.:Aphidiidae). Beitr. Ent. 12:631-661.

1963a. A re-examination of C. F. Baker's collection of aphid parasites (Hym.:Aphidiidae). Can. Ent. 95:921-935.

1965a. Aphidius smithi Sharma and Subba Rao a parasite of the pea aphid new in southern Ontario. Proc. Entomol. Soc. Ont. 95:121-124.

1965b. Parasitological data as an aid in aphid classification. Can. Ent. 97:1016-1024.

1965c. A new Aphidius species (Hym.:Aphidiidae) parasite on the blackberry aphid, Sitobion fragariae (F.) (Hom.: Aphididae). Dt. ent. Z., N.F. 12:347-349.

1968a. Insect parasites of the green peach aphid, Myzus pericae Sulz., and their control potential. Entomophaga 13(2):91-106.

1968b. Aphidius rubifolii n. sp. (Hym.:Aphidiidae), a parasi-

toid to Masonaphis maxima from British Columbia. J. Entomol. Soc. Brit. Columbia 65:34-35.

1969. Sexual behaviour of and hybridization between three species of Aphidius Nees parasitic on the pea aphid. (Hym.:Aphidiidae). Proc. Ent. Soc. Wash. 71:339-350.

Mackauer, M. & Stary, P.

1967. Index of entomophagous insects, world Aphidiidae (Hym.: Ichneumonoidea). Le Francois Paris 195 pp.

Muesebeck, C. F. W.

1958. Three new aphid parasites from the Pacific Coast. (Hym.:Braconidae, Aphidiinae). Ent. News 69:141-145.

Munz, P. A.

1968. A California Flora. Univ. of Calif. Press 1593 pp.

Narayanan, E. S., Subba Rao, B. R., Sharma, A. K. & Stary P.

1962. Revision of "A Catalogue of the known species of the world belonging to the Subfamily Aphidiinae" (Hym.: Braconidae). Beitr. Ent. 12:662-720.

Palmer, M. A.

1952. Aphids of the Rocky Mountain Region. The Thomas Say Foundation 5:1-452; pls. I-VIII; figs. 1-455.

Quilis, P. M.

1931. Especies nuevas de Aphidiidae espanoles (Hym.:Braconidae). Eos, Madr. 7:25-84.

Ruthe, J. F.

1858. Beiträge zur Kenntniss der Braconiden. Berl. ent. Z. 2:1-9.

1859. Verzeichnis der von Dr. Staudinger im Jahre 1856 auf Island gesammelten Hymenopteren. Stettin ent. Ztg. 20:305-332, 362-379.

Schlinger, E. I.

1960a. Diapause and secondary parasites nullify the effectiveness of rose aphid parasites in Riverside, California, 1957-8. J. Econ. Ent. 53:151-154.

Schlinger, E. I. & Hall, J. C.

1960b. Biological notes on Pacific Coast aphid parasites, and lists of California parasites (Aphidiinae) and their aphid hosts (Hym.:Brac.) Ann. Ent. Soc. Am. 53:404-415.

Schlinger, E. I. & Mackauer, M. J. P.

1963. Identity, distribution, and hosts of Aphidius matricariae Haliday, an important parasite of the green peach aphid, Myzus persicae (Hym.:Aphidiidae; Hom.: Aphididae). Ann. Ent. Soc. Am. 56:648-653.

Shands, W. A., Simpson, G. W., Roberts, F. S. & Muesebeck, C.F.W.

1955. Parasites of potato-infesting aphids and of some other aphids in Maine. Proc. Ent. Soc. Wash. 57:131-136.

Shands, W. A., Simpson, G. W., Muesebeck, C.F.W. & Wave, H. E.

1965. Parasites of potato-infesting aphids in northeastern Maine. Bull. Me. Agric. Exp. Stn. Techn. Ser. 19:1-77.

Smith, C. F.

1941. A new species of hymenopterous parasite of the pea aphid (Macrosiphum pisi Kaltenback). Ann. Ent. Soc. Am. 34: 537-538.

1944. The Aphidiinae of North America (Braconidae:Hymenoptera). Ohio State Univ., Columbus, XII +154pp. (Contr. Zool. Ent., No. 6).

Smith, C. F.

1972. Bibliography of the Aphididae of the world. N. Carol. Agric. Exp. Stn. Tech. Bull. No. 216:1-717.

Stary, P.

1963. A study on the relationship of the Myzinae and their aphidiid parasites in (Central) Europe (Hom.:Aphidoidea, Myzinae; Hym.:Aphidiidae) Boll. Lab. Ent. Agr. Filippo Silvestri 21:199-216.

1965. Aphidiid parasites of aphids in the USSR (Hym.:Aphidiidae). Acta Faun. ent. Mus. Nat. Prague. 10:187-227.

1966a. A review of the parasites of aphids associated with Prunus-trees in Czechoslovakia (Hym.:Aphididae; Hom: Aphidoidea). Cas. csl. Spol. ent. 63:67-75.

1966b. Aphid parasites of Czechoslovakia. W. Junk, The Hague 242 pp.

1966c. The Aphidiidae of Italy (Hym.:Ichneumonoidea). Boll. Ist. Ent. Univ. Bologna 28:65-139.

1970. Biology of aphid parasites with respect to integrated control. Series Entomologica, W. Junk, The Hague 6: 643pp., 326 figs.

Stary, P. & Schlinger, E. I.

1967. A revision of the Far East Asian Aphidiidae (Hymenop-

tera). Series Entomologica, W. Junk, The Hague 3:204pp., 190 figs.

Swain, A. F.

1919. A synopsis of the Aphididae of California. Univ. of Calif. Publ. Tech. Bull. Entomol. 3(1):1-221; pls. 1-17.

Takada, H.

1968. Aphidiidae of Japan. Ins. Mats. 30(2):67-124.

Van den Bosch, R., Schlinger, E. I., Lagace, C. F. and Hall, J.

1966. Parasitization of Acyrthosiphon pisum by Aphidius Smithi: A density-dependent process in Nature (Hom.: Aphididae; Hym.:Aphidiidae). Ecol. 47(6):6pp.

Watanabe, C.

1941. On two aphidiid parasites of the grain aphid, Macrosiphum granarium (Kirby). Ins. Mats. 15:167-170.

1957. Notes on Ashmead's Japanese Braconidae (Hymenoptera). Ins. Mats. 21:1-5.

Wiackowski, S. K.

1960a. Laboratory studies on the biology and ecology of Aphidius smithi Sharma and Subba Rao. Bull. Acad. Polon. Sci. 8:503-506.

1960b. Control of alfalfa pests in the U.S.A., a good example of integrated control in plant protection (in Pol.). Postepy Nauk Roln., Warszaw 63:115-129.

1961a. Studies on the biology and ecology of Aphidius smithi Sharma and Subba Rao (Hym.:Braconidae), a parasite of

the pea aphid Acyrthosiphon pisum (Harris) (in Pol.) Thesis, Dzial wyd. nauk., SGGW. 73 pp.

1961b. Laboratory studies on the biology and ecology of the parasite Aphidius smithi Sharma and Subba Rao (Hym.: Braconidae) introduced from Pakistan to California in purpose of biological control of the pea aphid Acyrthosiphon pisum (Harris) (in Pol.) Postepy Nauk Roln., A. Probl., Warszaw 35:137-41.

1962. Studies on the biology and ecology of Aphidius smithi Sharma and Subba Rao (Hym.:Braconidae), a parasite of the pea aphid, Acyrthosiphon pisum (Harris). Bull. ent. Pologne 32:253-310.

Yasumatsu, K. & Watanabe, C.

1964. A tentative catalogue of insect natural enemies of injurious insects in Japan. Part 1. Parasite-predator host catalogue. Ent. Lab. Fac. Agric. Kyushu Univ., Fukuoka, VII +166 pp.

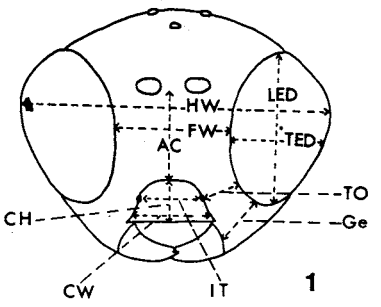
Supplement

Millan E.

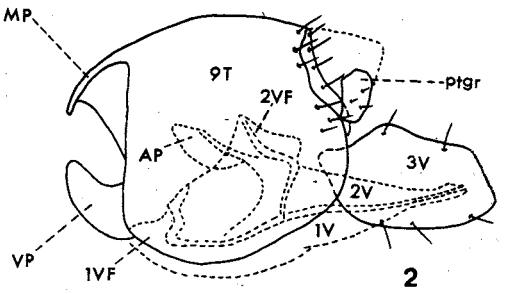
1956. Metamorfosis y ecologia de Aphidius platensis Bréthes. Rev. Invest. Agric., 10:243-80.

Plate I. Morphological Features

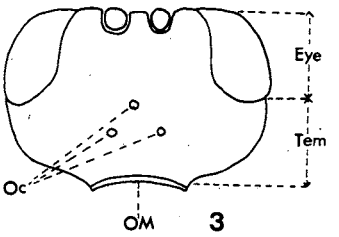
1. Frontal view of head. AC = antenna-clypeal line, CH = clypeal height, CW = clypeal width, FW = facial width, Ge = gena, HW = head-width, IT = intertentorial line, LED = longitudinal eye-diameter, TED = transversal eye-diameter, TO = tentoriocular line.
2. Lateral view of female genitalia. AP = anterior prong of 2nd valvula, MP = median prong of 9th tergite, 9th = 9th tergite, Ptgr = proctiger, V = valvula, VF = valvifer, VP = ventral prong of 9th tergite.
3. Dorsal view of head. Eye = compound eye, Tem = temple, Oc = ocellus, OM = occipital margin.
4. Fore wing. Ab = abscissa, An = anal vein, B = basal vein, Cr = cross vein, Cu = cubitus, Cu 1(2) = cubital 1(2), C+Sc = costa + subcosta, Mt = metacarpus, MRc = medio-radial cell, Pt = pterostigma (stigma).
5. Antenna (basal part). Sc = scape, Pe = pedicel, 1FS = 1st flagellar segment.
6. Lateral view of thorax. CX = coxa, MSCT = mesoscutum, MSPL = mesopleuron, MTN = metanotum, MTPL = metapleuron, NOT = notaulix, PROP = propodeum, PSCTL = postscutellum, PN = pronotum, PP = propleuron, SCTL = scutellum, Sp = spiracle, T = tergite, TG = tegula.


HW
FW
AC
LED
TED
TO
Ge
CH
CW
IT

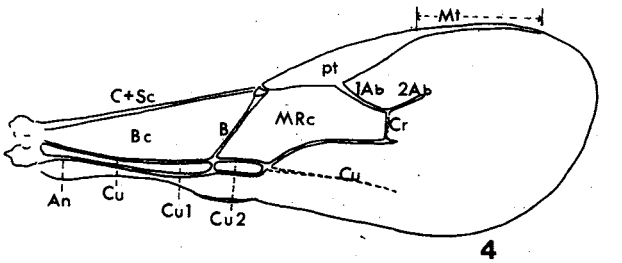
1


MP
9T
2VF
ptgr
AP
3V
2V
1V
VP
1VF

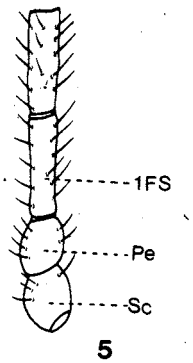
2


Eye
Tem
Oc
OM

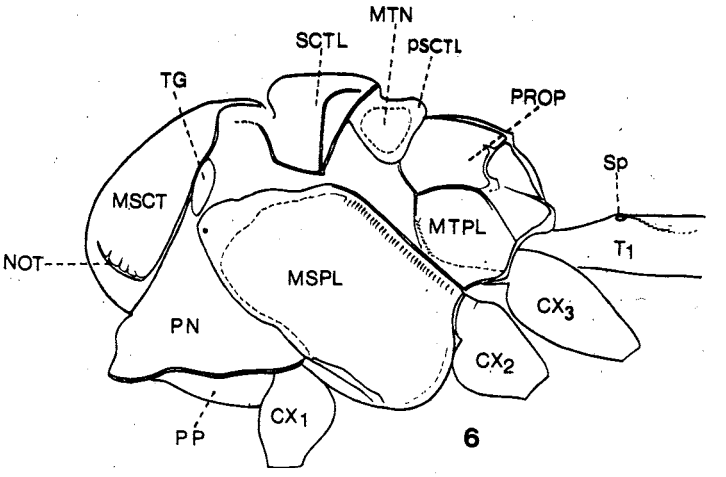
3


Mt
pt
1Ab
2Ab
C+Sc
MRc
Cr
Bc
B
Cu
An
Cu
Cu1
Cu2

4


1FS
Pe
Sc

5


MTN
SCTL
pSCTL
TG
PROP
Sp
MSCT
MTPL
T1
NOT
MSPL
CX3
PN
CX2
CX1
PP

6

Plate II. Head and Antenna

Dorsal view of head:

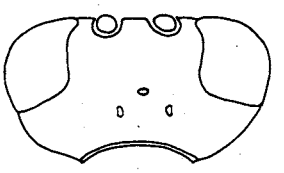
7. Aphidius areolatus Ashmead
8. Aphidius dauci Marshall
9. Aphidius amelanchieri n. sp.

Frontal view of head:

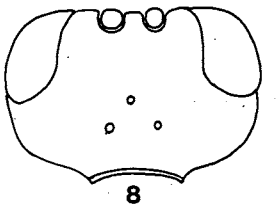
10. Aphidius pisivorous Smith
11. Aphidius pteridis n. sp.
12. Aphidius cingulatus Ruthe
13. Aphidius amelanchieri n. sp.
14. Aphidius liriodendrii n. sp.
15. Aphidius lupini n. sp.
16. Aphidius montereyensis n. sp.

Antenna (Segments 1-4):

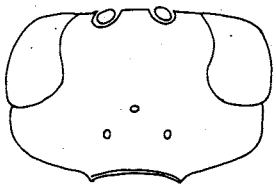
17. Aphidius areolatus Ashmead
18. Aphidius amelanchieri n. sp.
19. Aphidius amphorophori n. sp.
20. Aphidius pteridis n. sp.



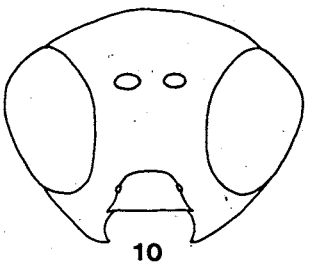
7



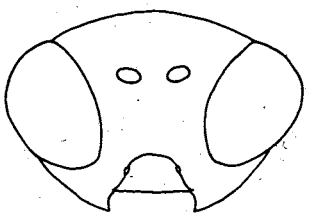
8



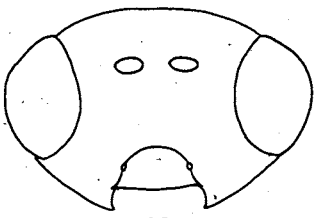
9



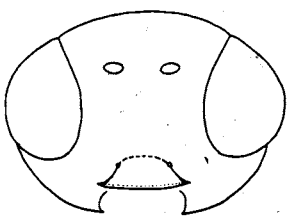
10



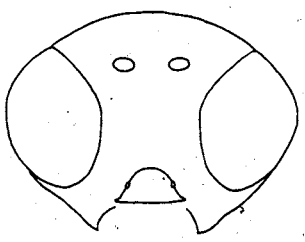
11



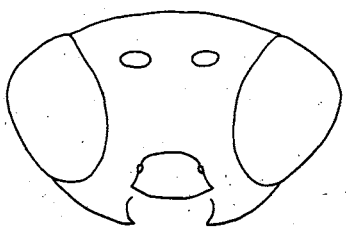
12



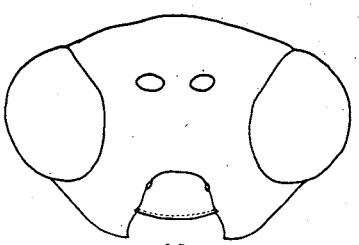
13



14



15



16

17

18

19

20

Plate III. Antenna and Propodeum

Antenna (segments 1-4):

21. Aphidius absinthii Marshall

22. Aphidius delicatus Baker

Dorsocaudal view of propodeum:

23. Aphidius absinthii Marshall

24. Aphidius asteris Ashmead

25. Aphidius pteridis n. sp.

26. Aphidius areolatus Ashmead

27. Aphidius amelanchieri n. sp.

28. Aphidius delicatus Baker

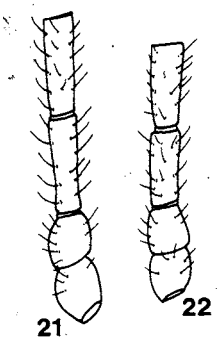
29. Aphidius avenaphis (Fitch)

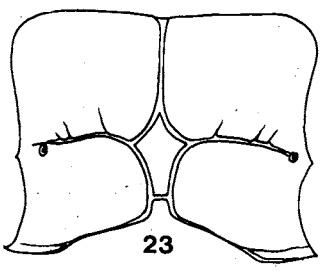
30. Aphidius matricariae Haliday

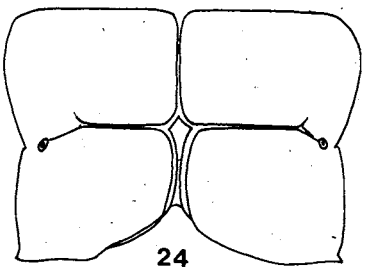
31. Aphidius ribis Haliday

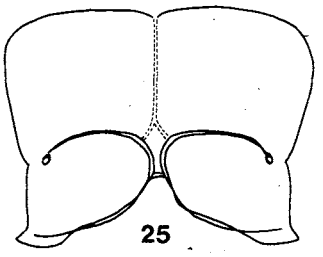
32. Aphidius dauci Marshall

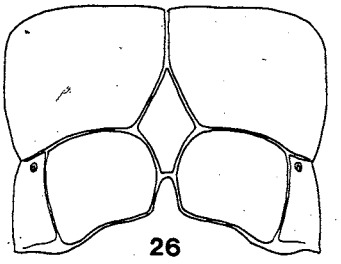
33. Aphidius liriodendrii n. sp.

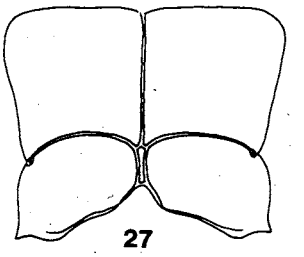

21
22

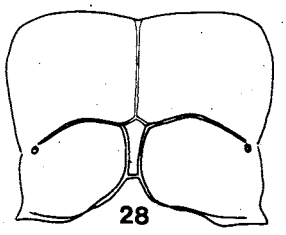

23

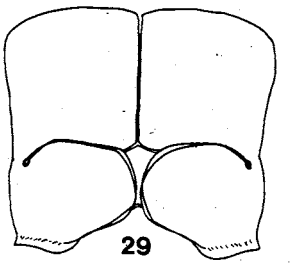

24

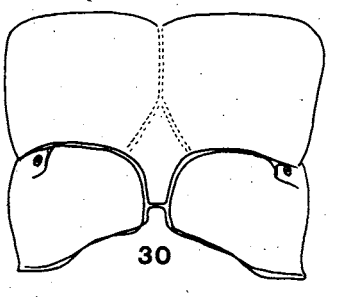

25

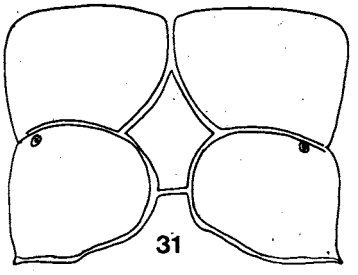

26

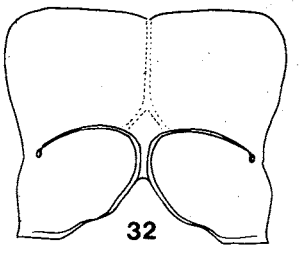

27


28


29


30


31


32

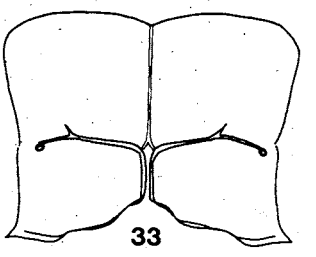

33

Plate IV. Propodeum and Petiole

Dorsocaudal view of propodeum:

34. Aphidius polygonaphis (Fitch)

35. Aphidius amphorophori n. sp.

36. Aphidius montereyensis n. sp.

37. Aphidius gifuensis Ashmead

Dorsal view of petiole:

38. Aphidius amphorophori n. sp.

39. Aphidius pisivorous Smith

40. Aphidius smithi Sharma & Rao

41. Aphidius vaccinii n. sp.

42. Aphidius lupini n. sp.

43. Aphidius masonaphis n. sp.

44. Aphidius pteridis n. sp.

45. Aphidius delicatus Baker

46. Aphidius areolatus Ashmead

47. Aphidius dauci Marshall

48. Aphidius alius Muesebeck

49. Aphidius amelanchieri n. sp.

50. Aphidius asteris Ashmead

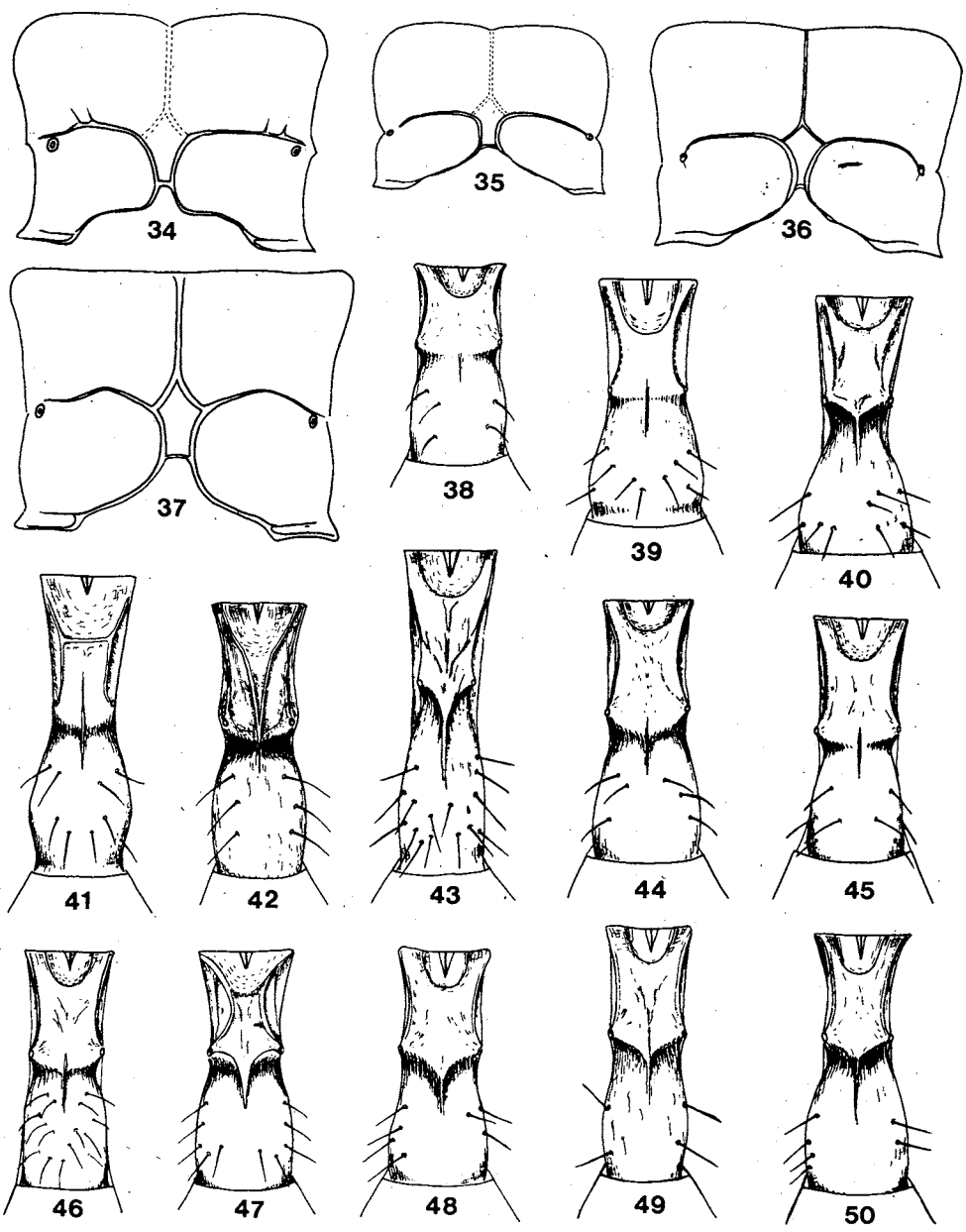

34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50

Plate V. Petiole and Female Genitalia

Dorsal view of petiole:

51. Aphidius montereyensis n. sp.

52. Aphidius gifuensis Ashmead

53. Aphidius lonicerae Marshall

54. Aphidius avenaphis (Fitch)

55. Aphidius liriodendrii n. sp.

Lateral view of genitalia:

56. Aphidius vaccinii s. sp.

47. Aphidius phorodontis Ashmead

58. Aphidius ribis Haliday

59. Aphidius masonaphis n. sp.

60. Aphidius amelanchieri n. sp.

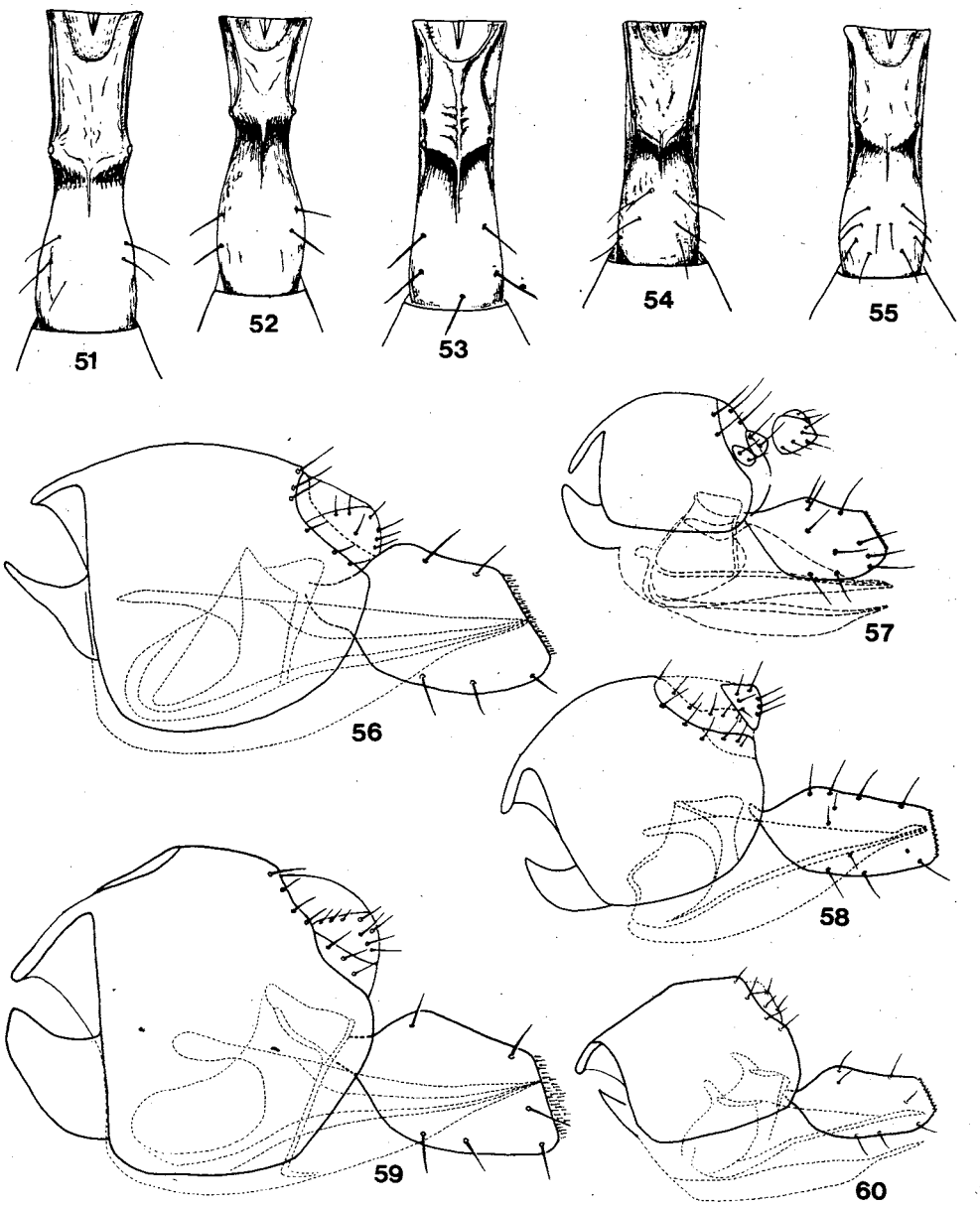

51
52
53
54
55
56
57
58
59
60

Plate VI. Genitalia

Lateral view of genitalia:

61. Aphidius pteridis n. sp.

62. Aphidius polygonaphis (Fitch)

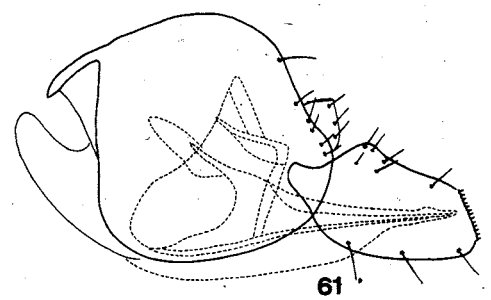
63. Aphidius salicis Haliday

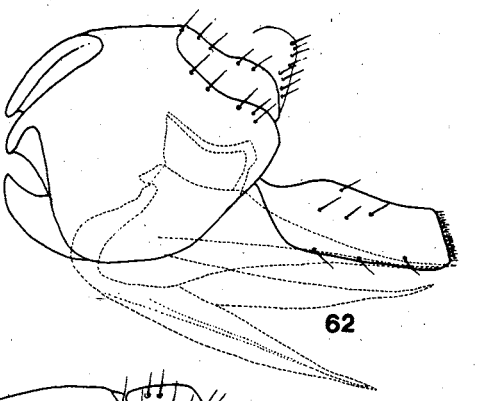
64. Aphidius lupini n. sp.

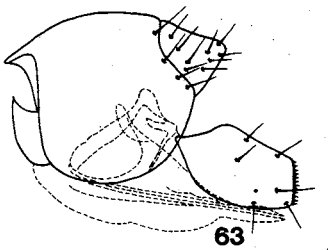
65. Aphidius delicatus Baker

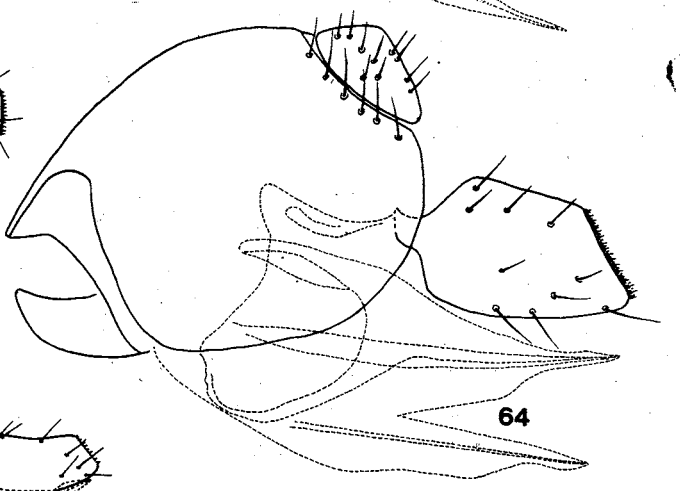
66. Aphidius amphorophori n. sp.

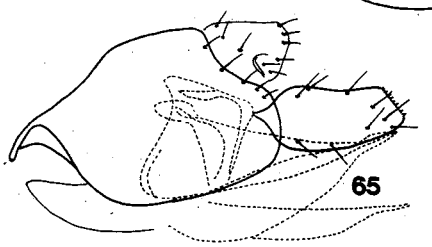
67. Aphidius montereyensis n. sp.

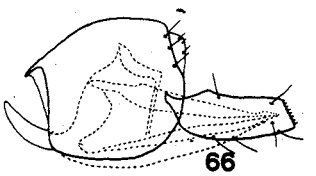

61


62


63


64


65


66

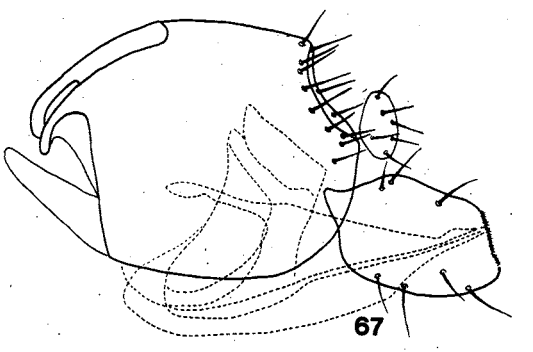

67

Plate VII. Genitalia

Lateral view of genitalia:

68. Aphidius cingulatus Ruthe

69. Aphidius rosae Haliday

70. Aphidius ohioensis Smith

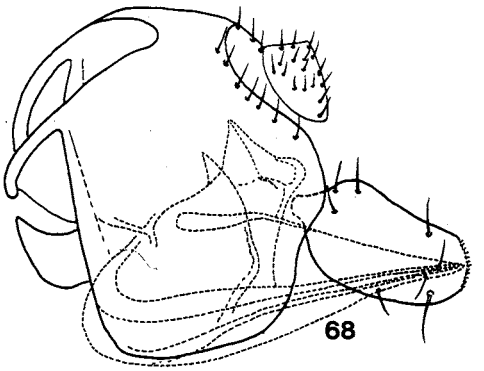
71. Aphidius matricariae Haliday

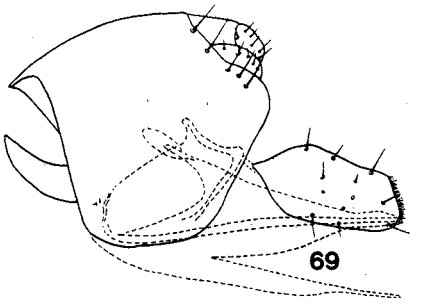
72. Aphidius gifuensis Ashmead

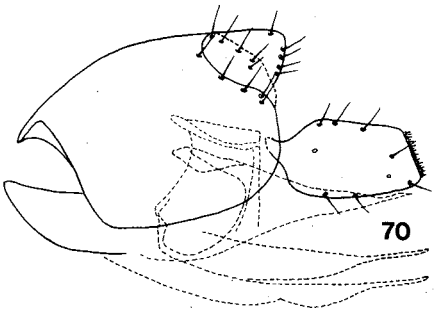
73. Aphidius absinthii Marshall

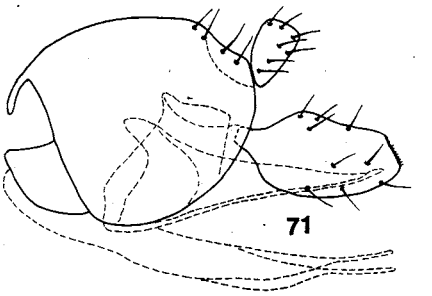
74. Aphidius floridaensis Smith

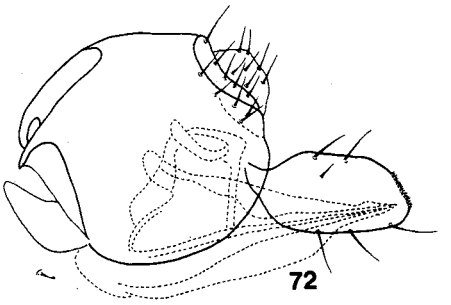
75. Aphidius dauci Marshall

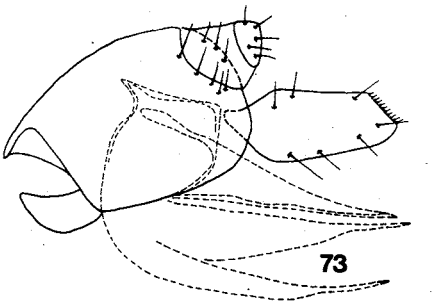

68

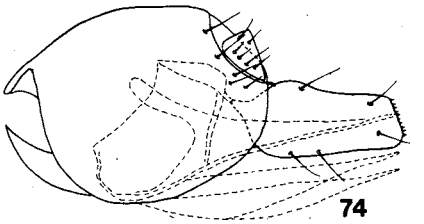

69


70


71


72


73


74

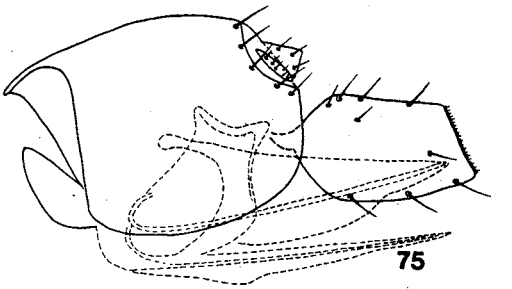

75

Plate VIII. Genitalia

Lateral view of genitalia:

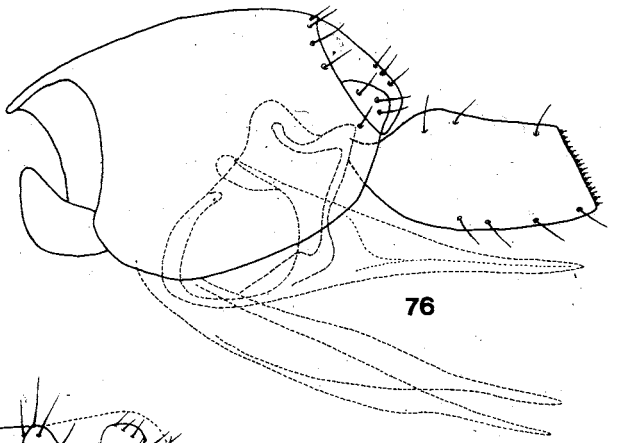
76. Aphidius lonicerae Marshall

76. Aphidius areolatus Ashmead

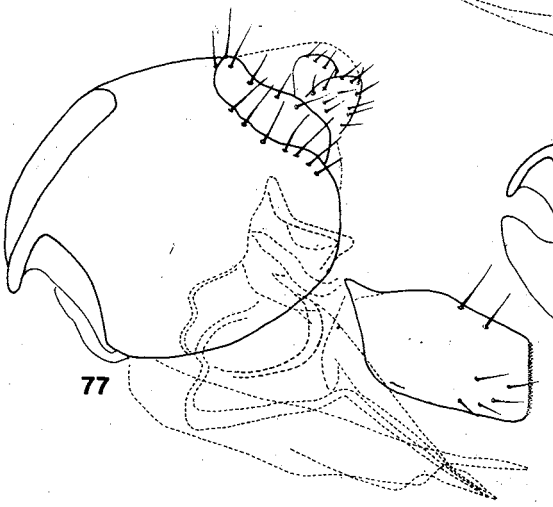
78. Aphidius liriodendrii n. sp.

79. Aphidius alius Muesebeck

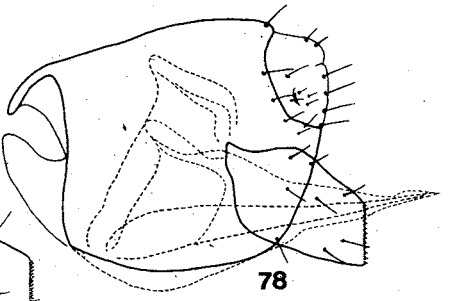
80. Aphidius sp. (reared from Capitophorous chiloquin)



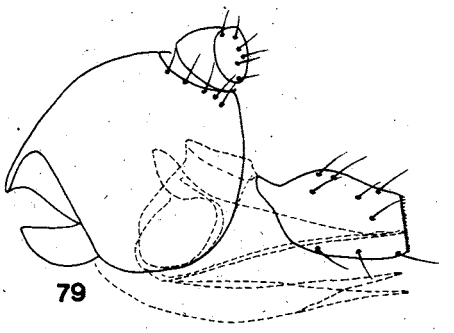
76



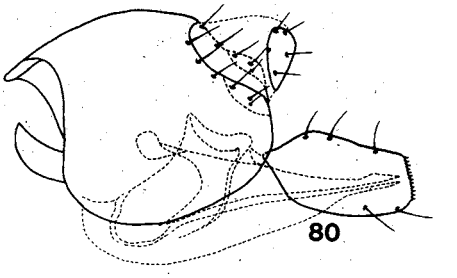
77



78



79



80

Plate IX. Genitalia

Lateral view of genitalia:

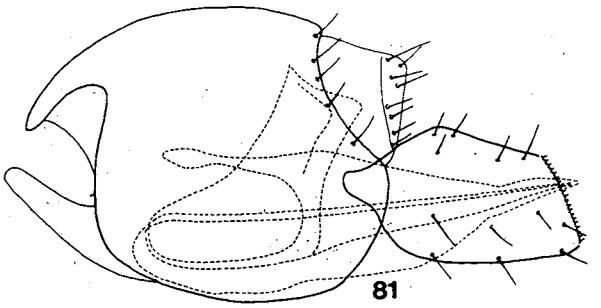
81. Aphidius pisivorous Smith

82. Aphidius asteris Ashmead

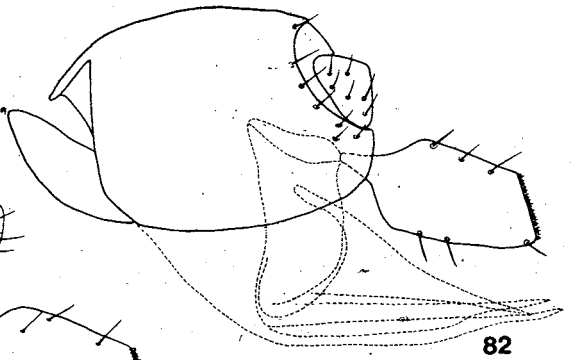
83. Aphidius nigripes Ashmead

84. Aphidius smithi Sharma & Rao

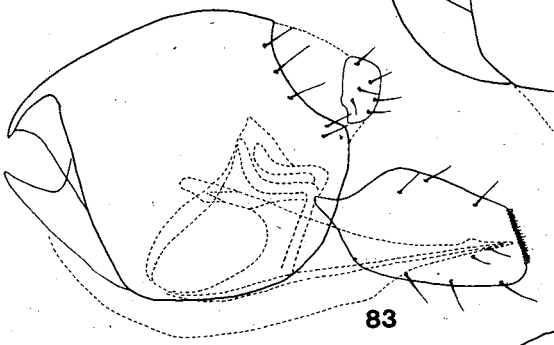
84. Aphidius avenaphis (Fitch)



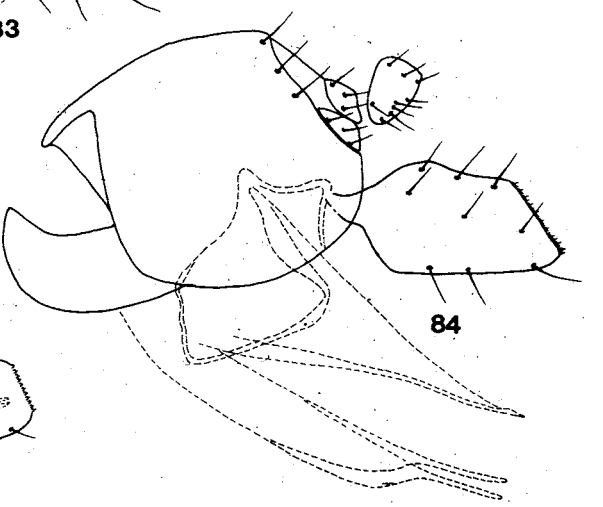
81



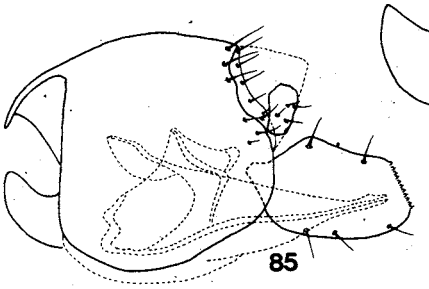
82



83



84



85

Plate X. Fore Wing

86. Aphidius masonaphis n. sp.

87. Aphidius gifuensis Ashmead

88. Aphidius smithi Sharma & Rao

89. Aphidius lonicerae Marshall

90. Aphidius nigripes Ashmead

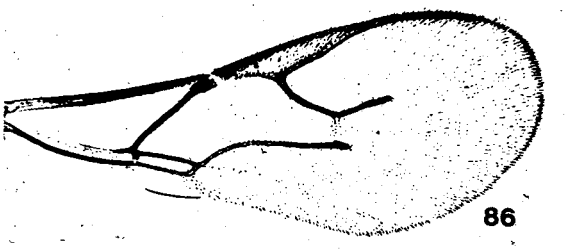
91. Aphidius montereyensis n. sp.

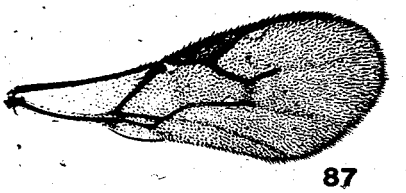
92. Aphidius vaccinii n. sp.

93. Aphidius pteridis n. sp.

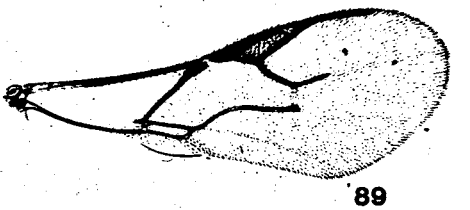
94. Aphidius lupini n. sp.

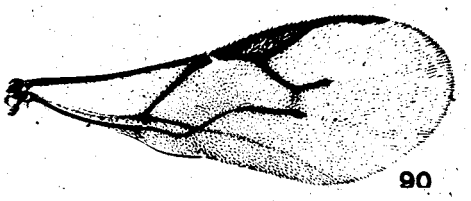
95. Aphidius polygonaphis (Fitch)

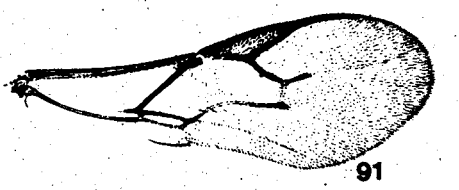

86

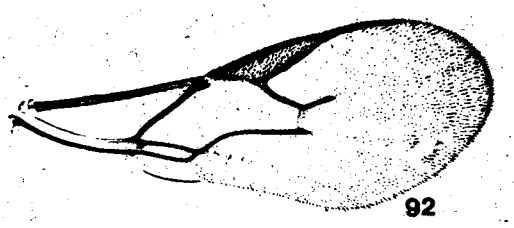

87

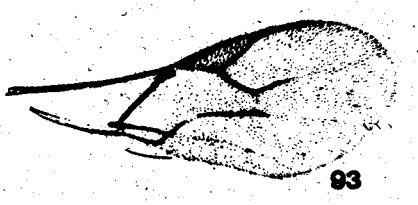
88


89


90


91


92


93

94

95

Plate XI. Fore Wing

96. Aphidius absinthii Marshall

97. Aphidius delicatus Baker

98. Aphidius matricariae Haliday

99. Aphidius ohioensis Smith

100. Aphidius floridaensis Smith

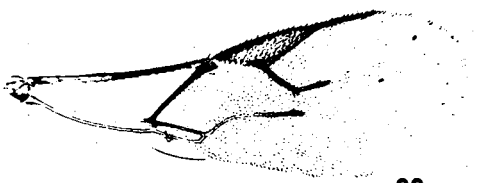
101. Aphidius liriodendrii n. sp.

102. Aphidius amelancheri n. sp.

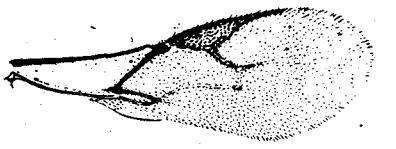
103. Aphidius alius Muesebeck

104. Aphidius asteris Ashmead

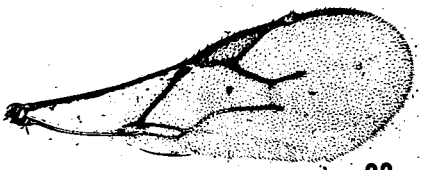
105. Aphidius ribis Haliday



96

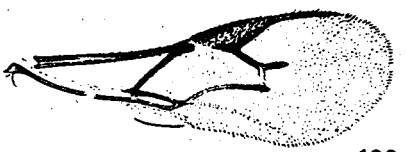


97

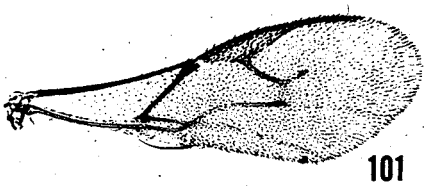


98

99

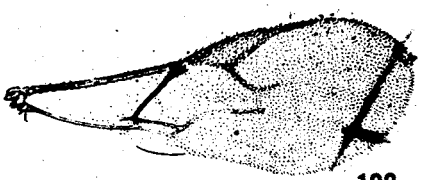


100

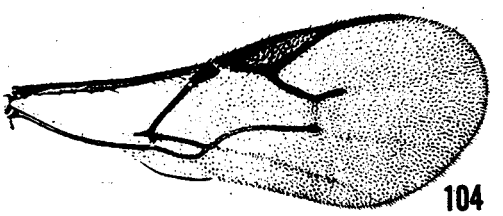


101

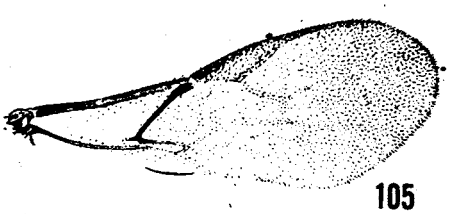
102



103



104



105

Plate XII. Fore Wing

106. Aphidius rosae Haliday

107. Aphidius dauci Marshall

108. Aphidius phorodontis Ashmead

109. Aphidius salicis Haliday

110. Aphidius areolatus Ashmead

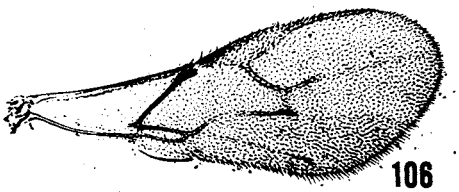
111. Aphidius avenaphis (Fitch)

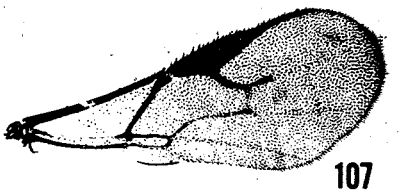
112. Aphidius amphorophori n. sp.

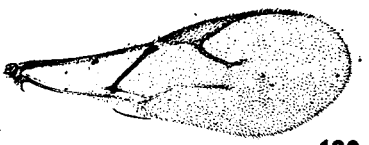
113. Aphidius sp. (reared from Capitophorous chiloquin)

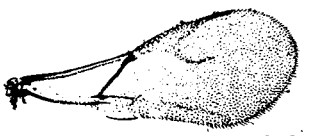
114. Aphidius cingulatus Ruthe

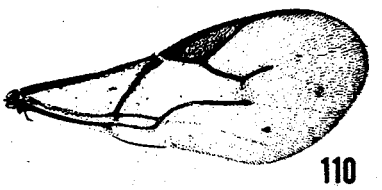
115. Aphidius pisivorous Smith

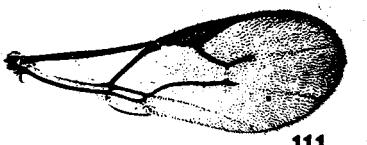

106


107

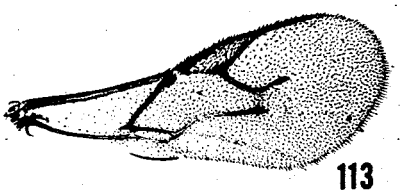

108


109

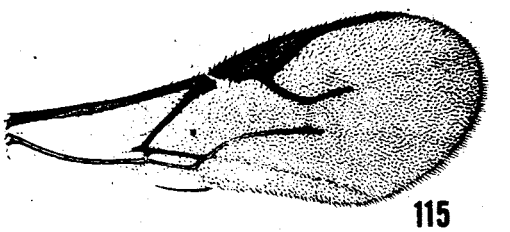

110

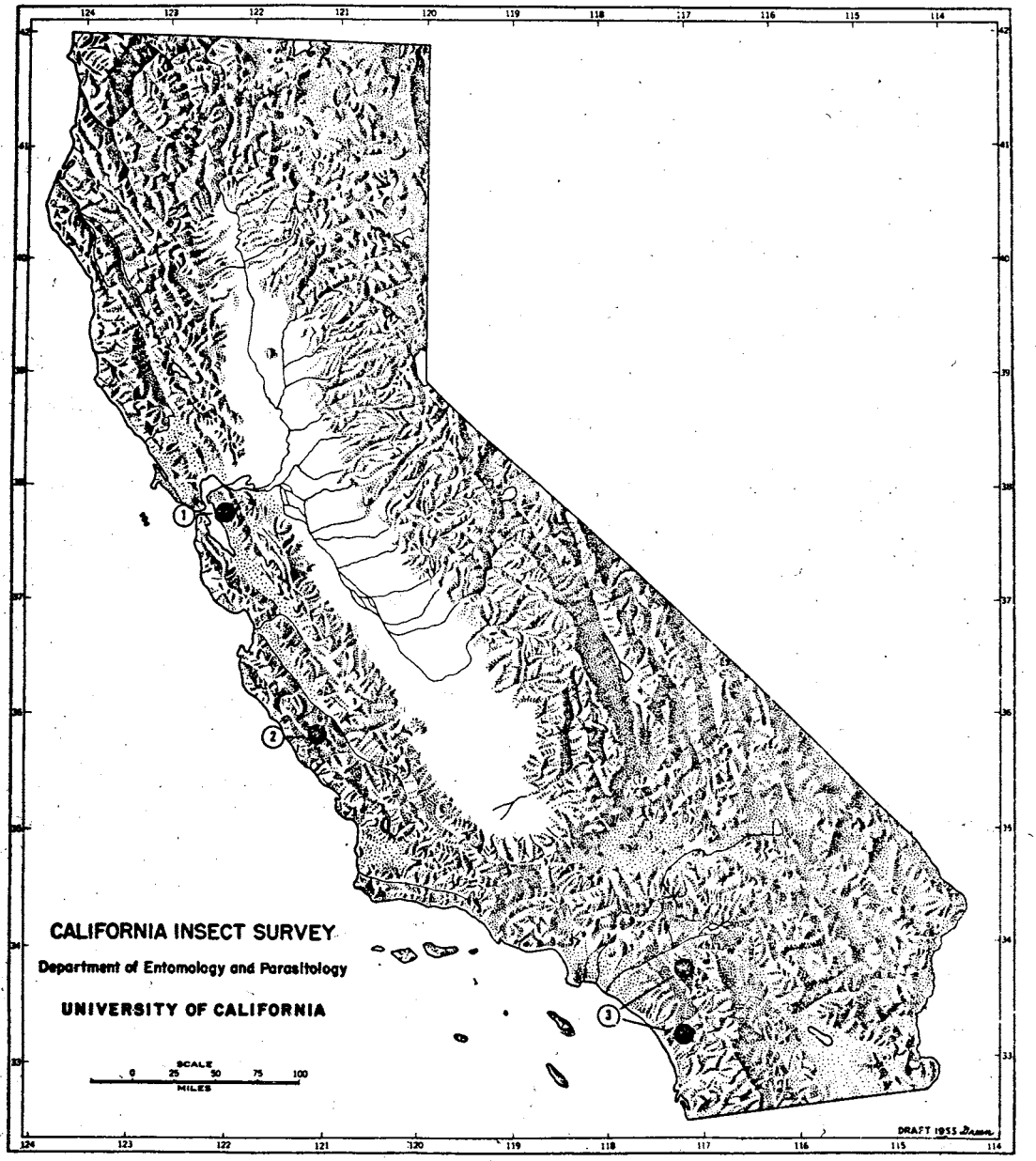

111

112

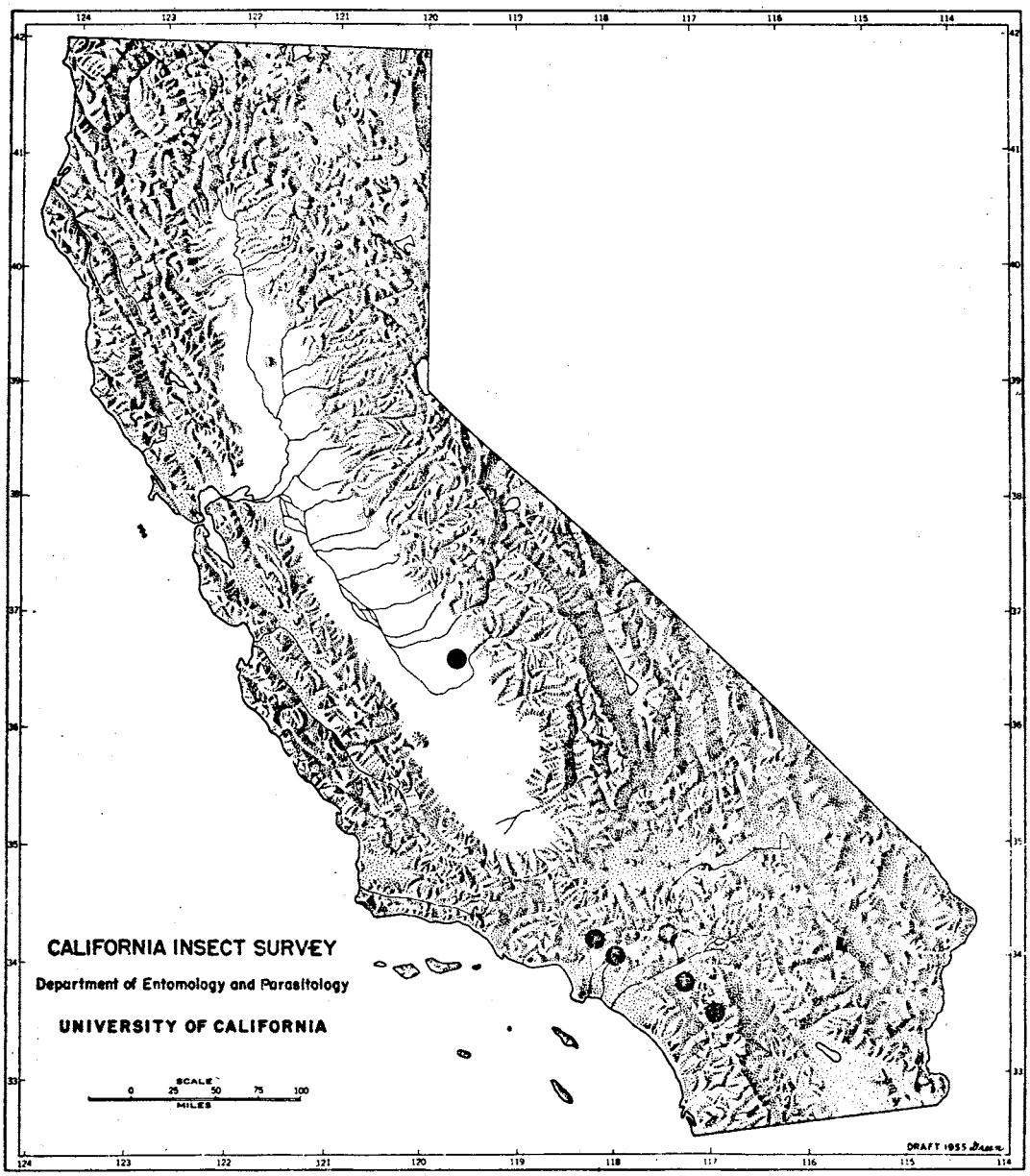

113

114

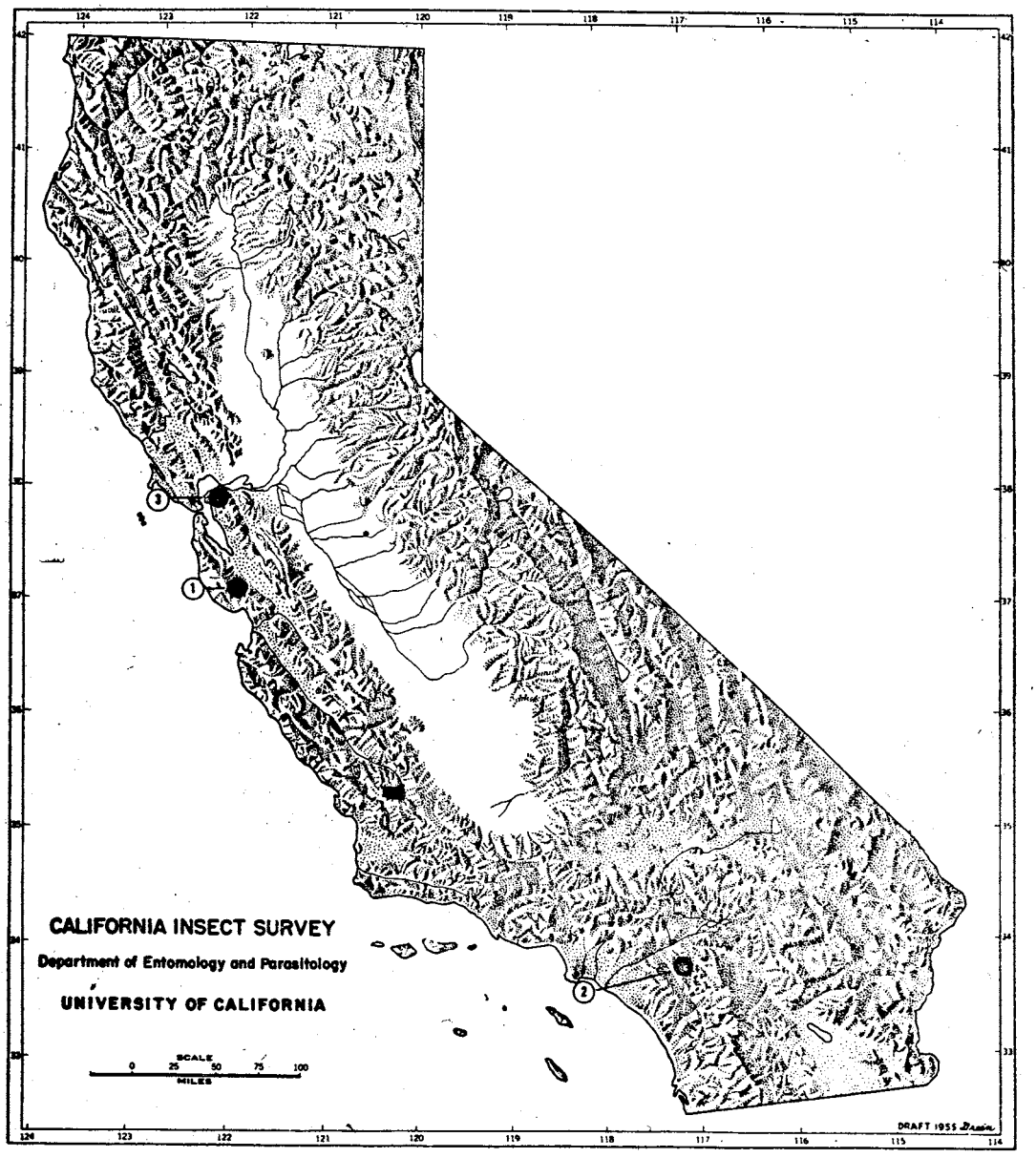

115



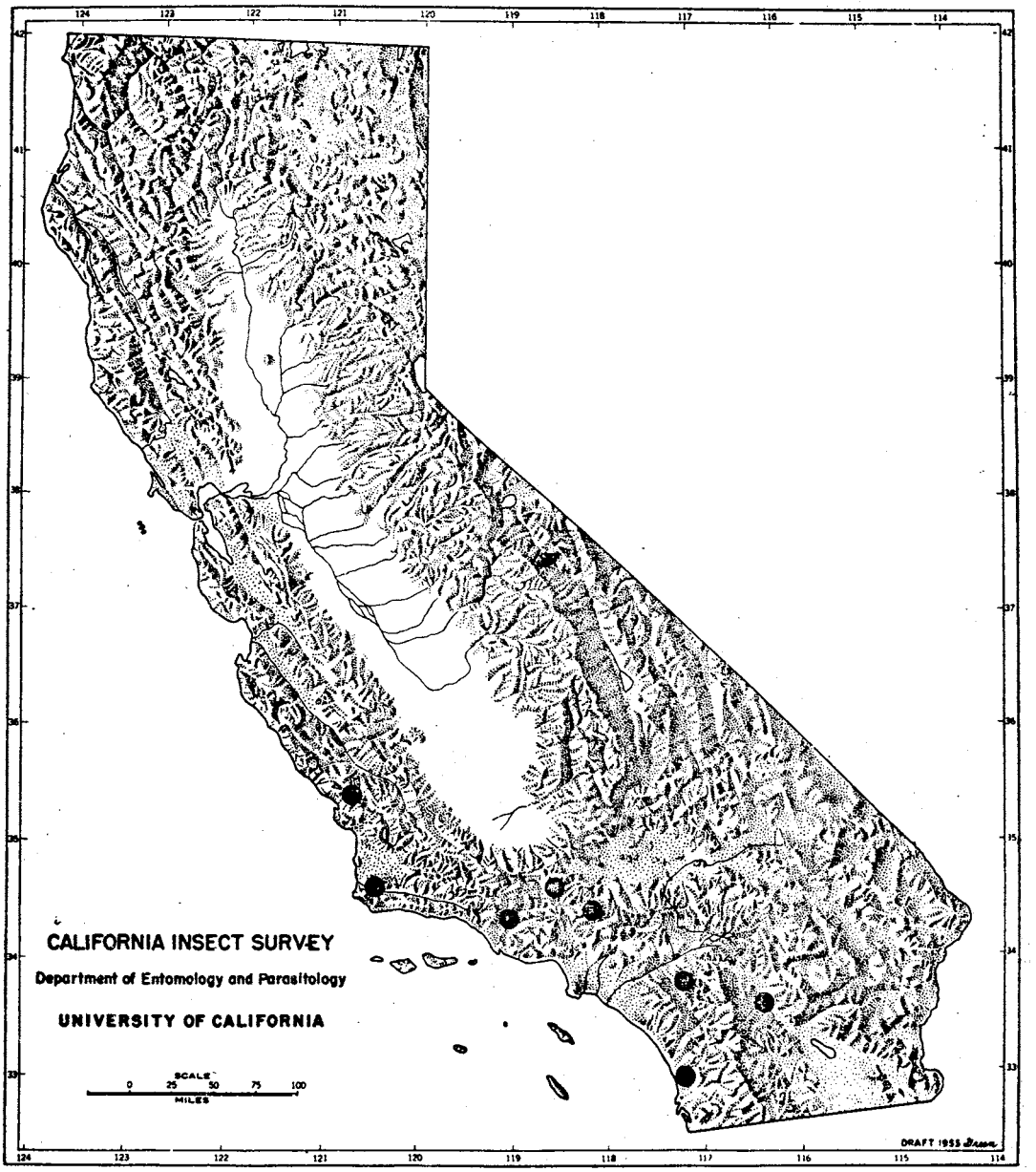
Map 1. California Distribution of Aphidius areolatus (= 1), A. amelancheri (= 2), and A. absinthii (= 3)



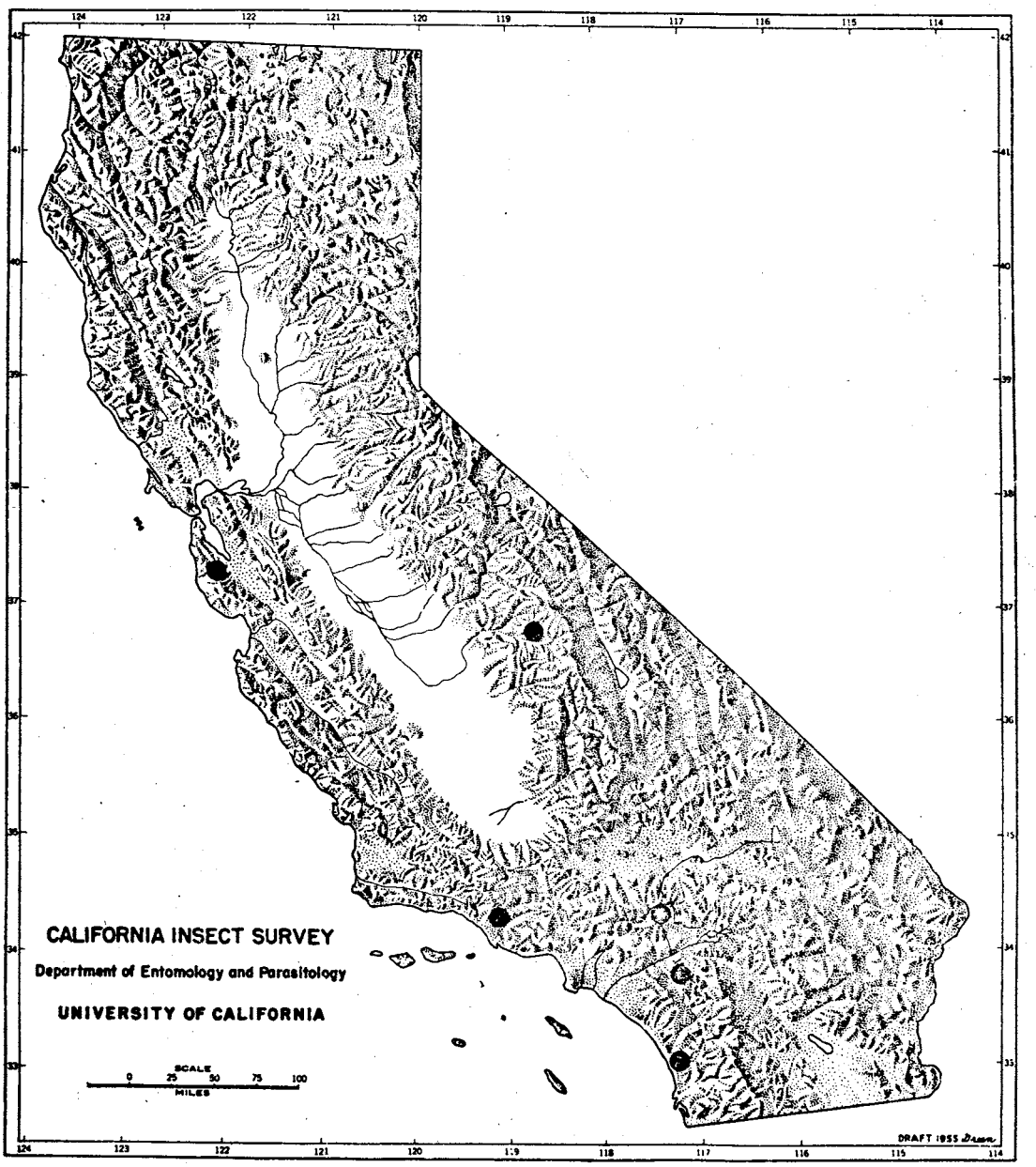
Map 2. California Distribution of Aphidius alius



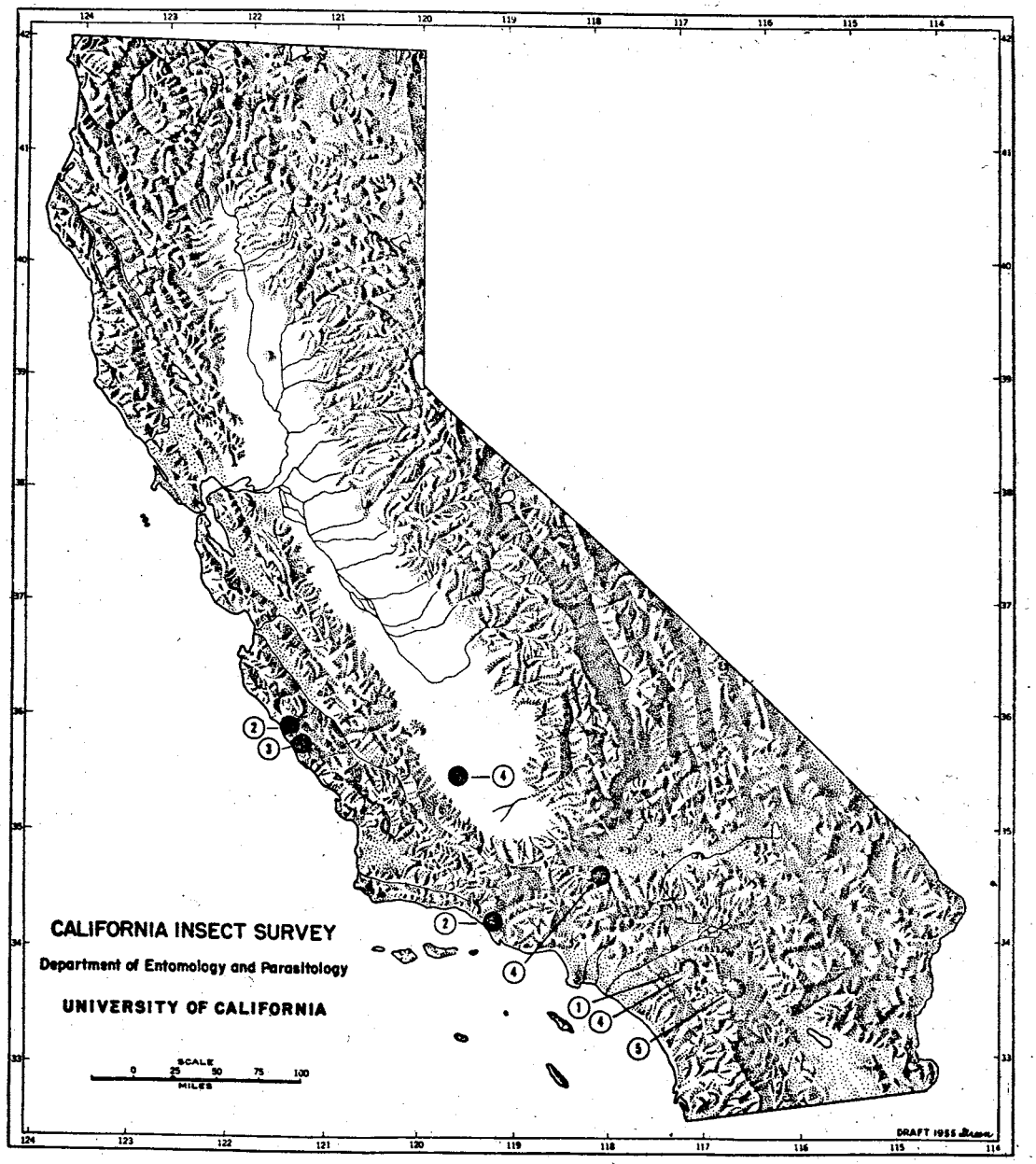
Map 3. California Distribution of Aphidius lonicerae (= 1), A. amphorophora (= 2), and A. nigripes (= 3)



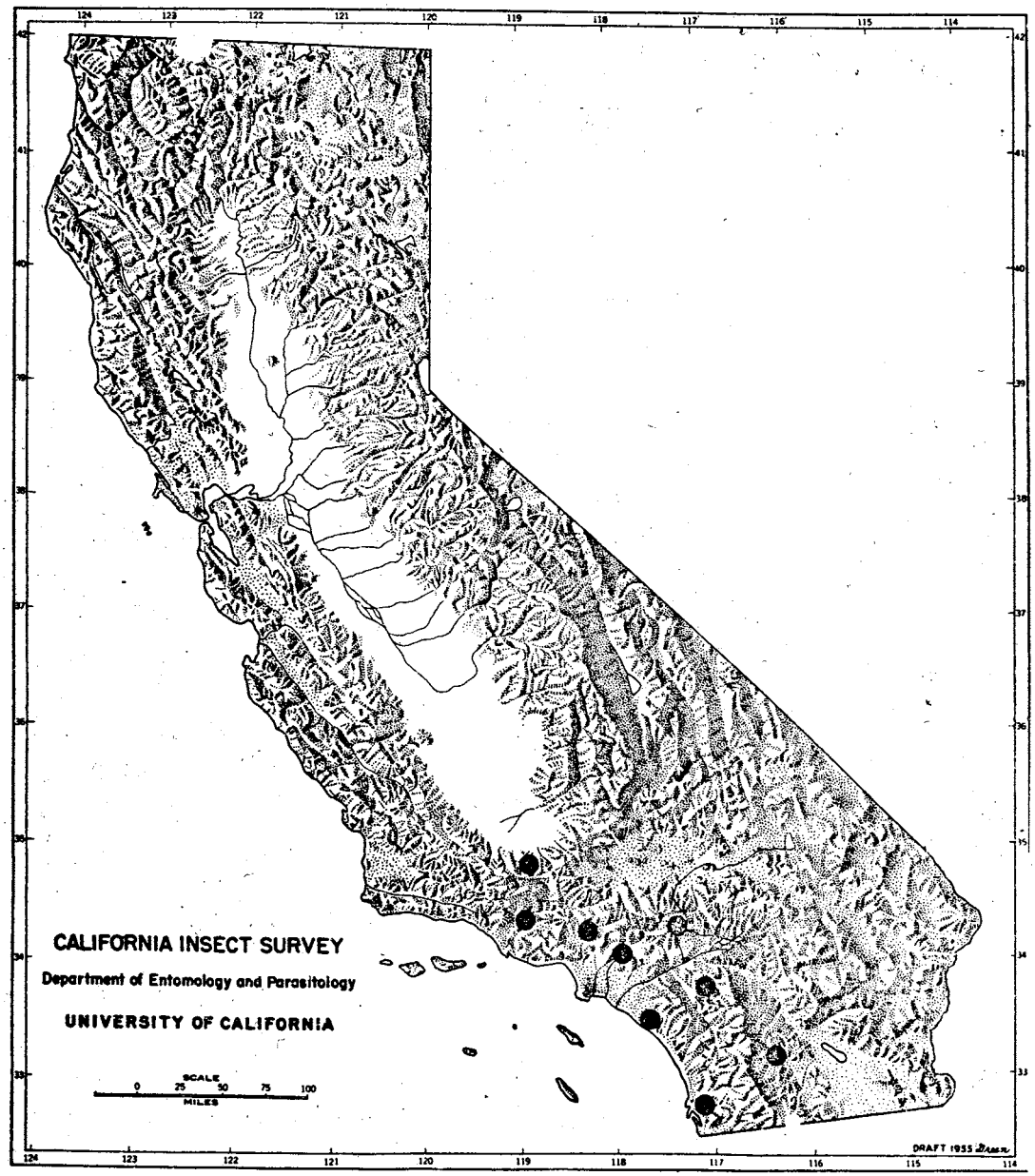
Map 4. California Distribution of Aphidius asteris



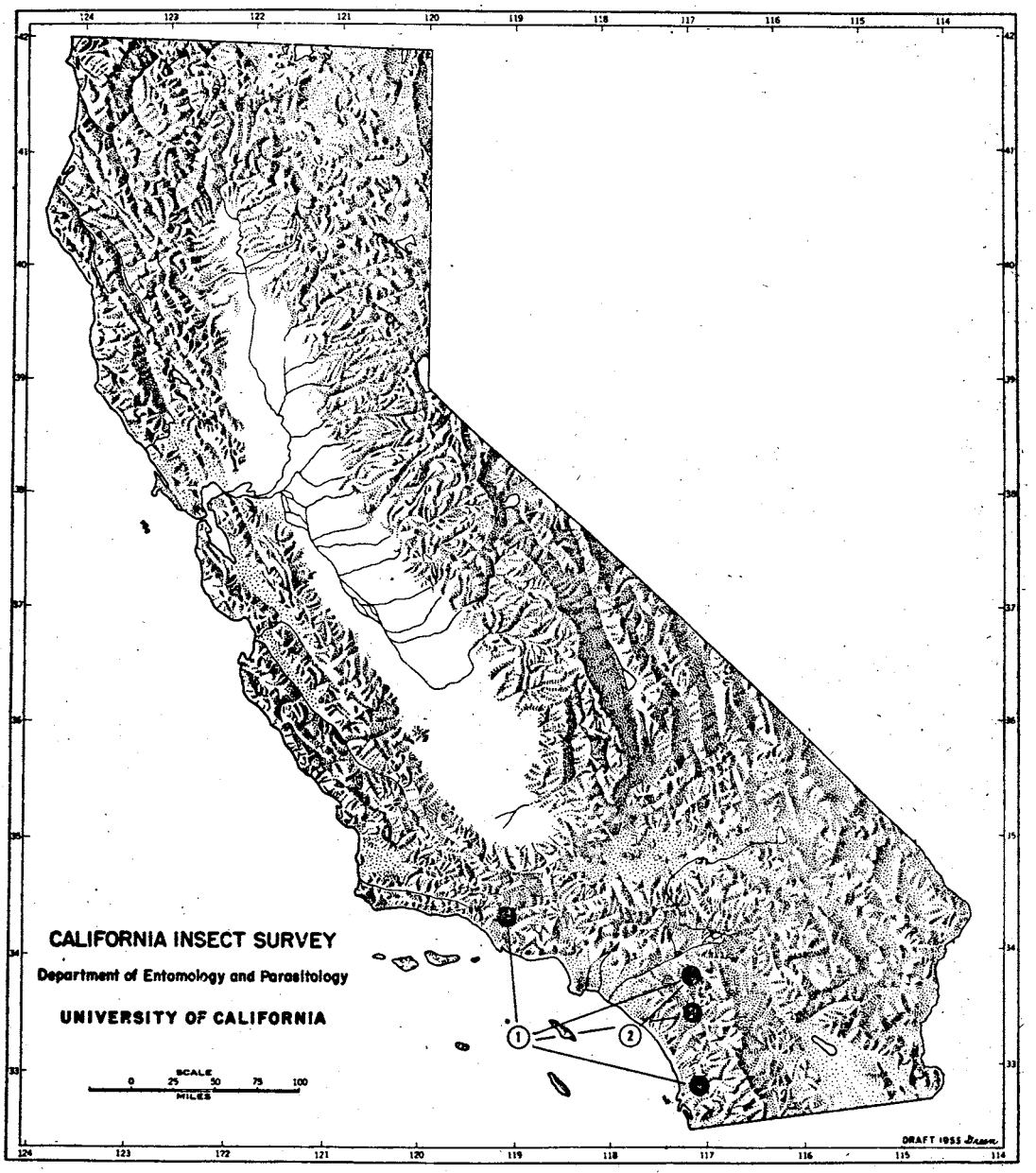
Map 5. California Distribution of Aphidius cingulatus



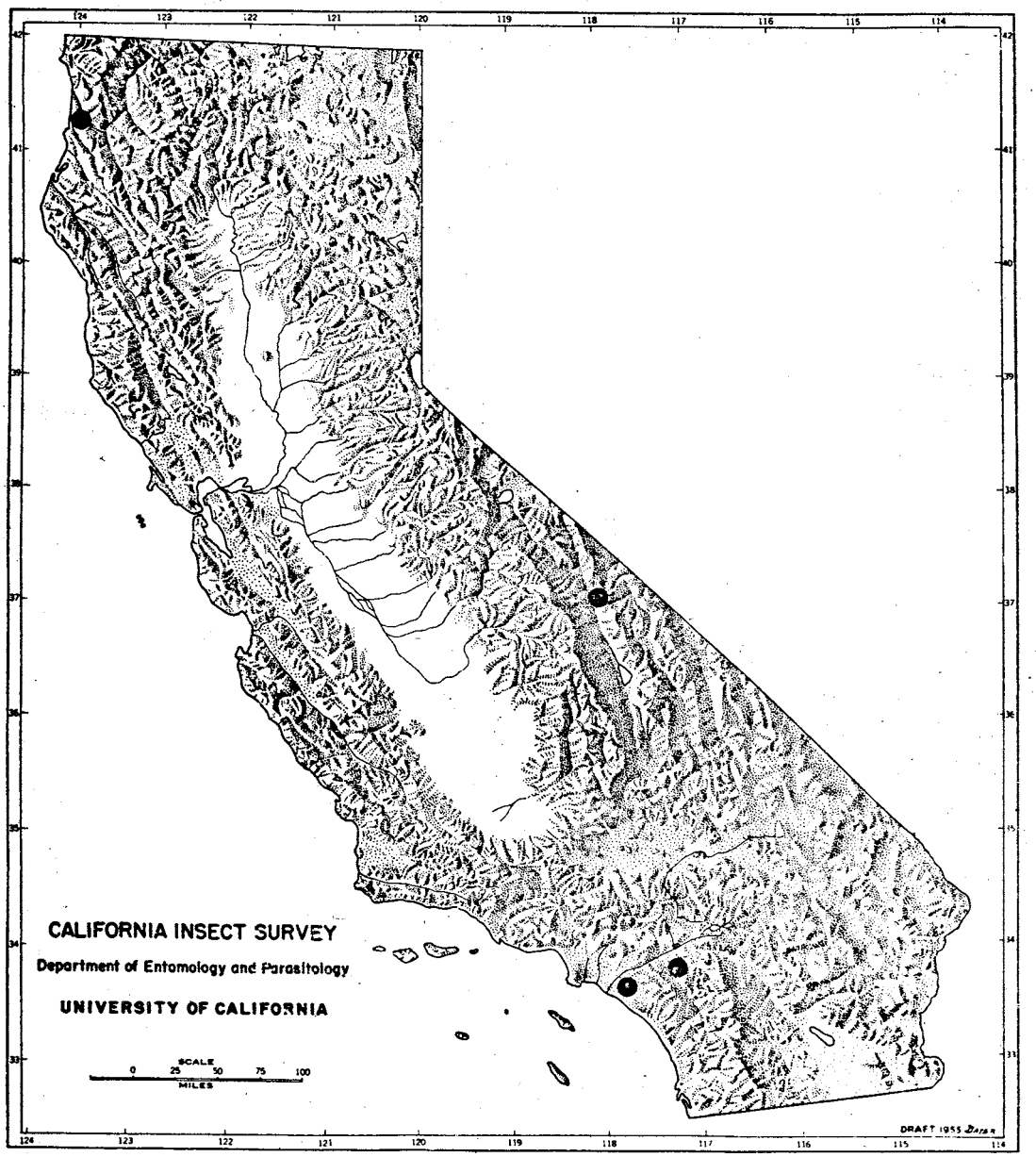
Map 6. California Distribution of Aphidius delicatus (= 1), A. lupinus (= 2), A. montereyensis (= 3), A. pisivorous (= 4), and A. pteridis (= 5)



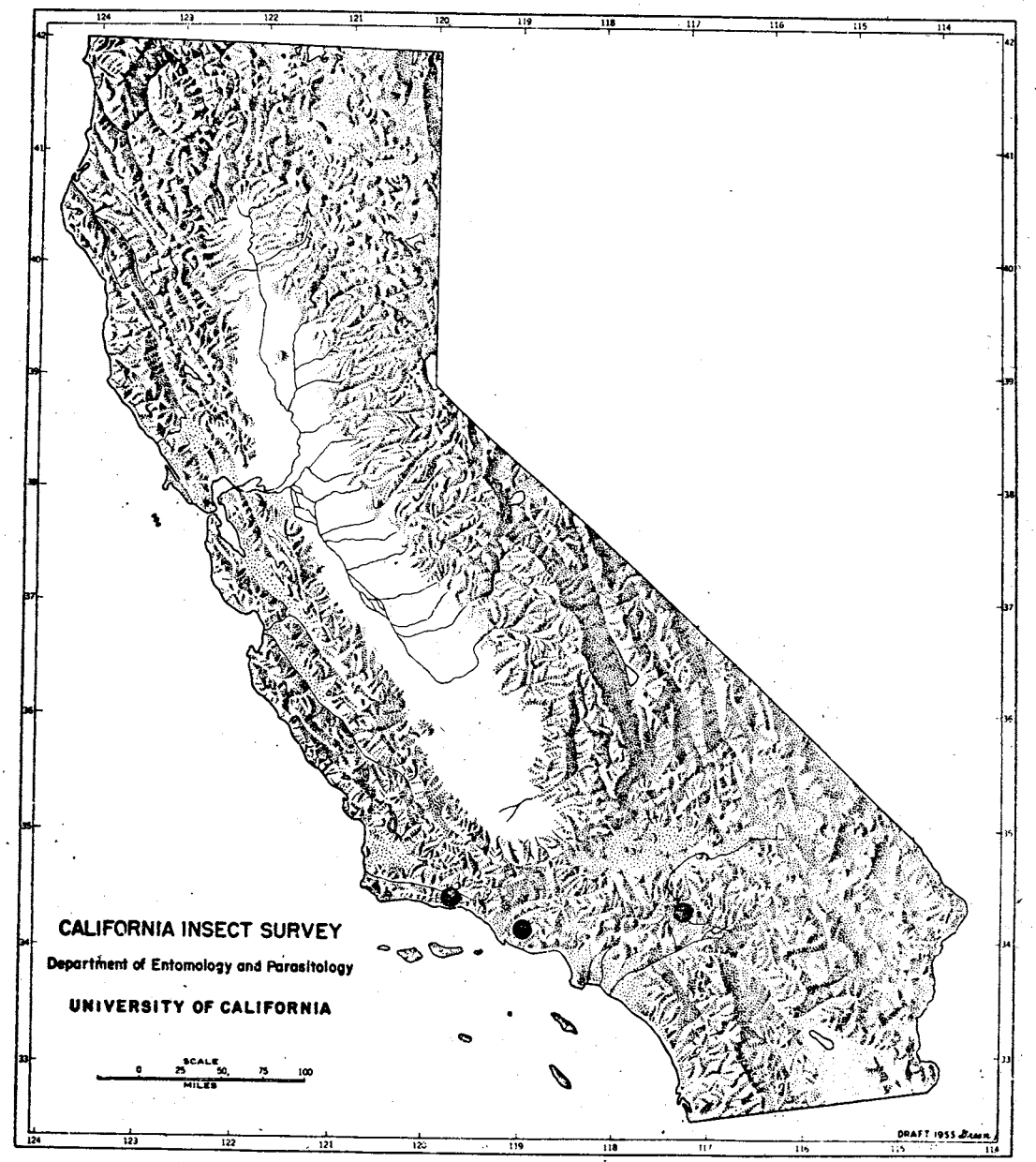
Map 7. California Distribution of Aphidius matricariae



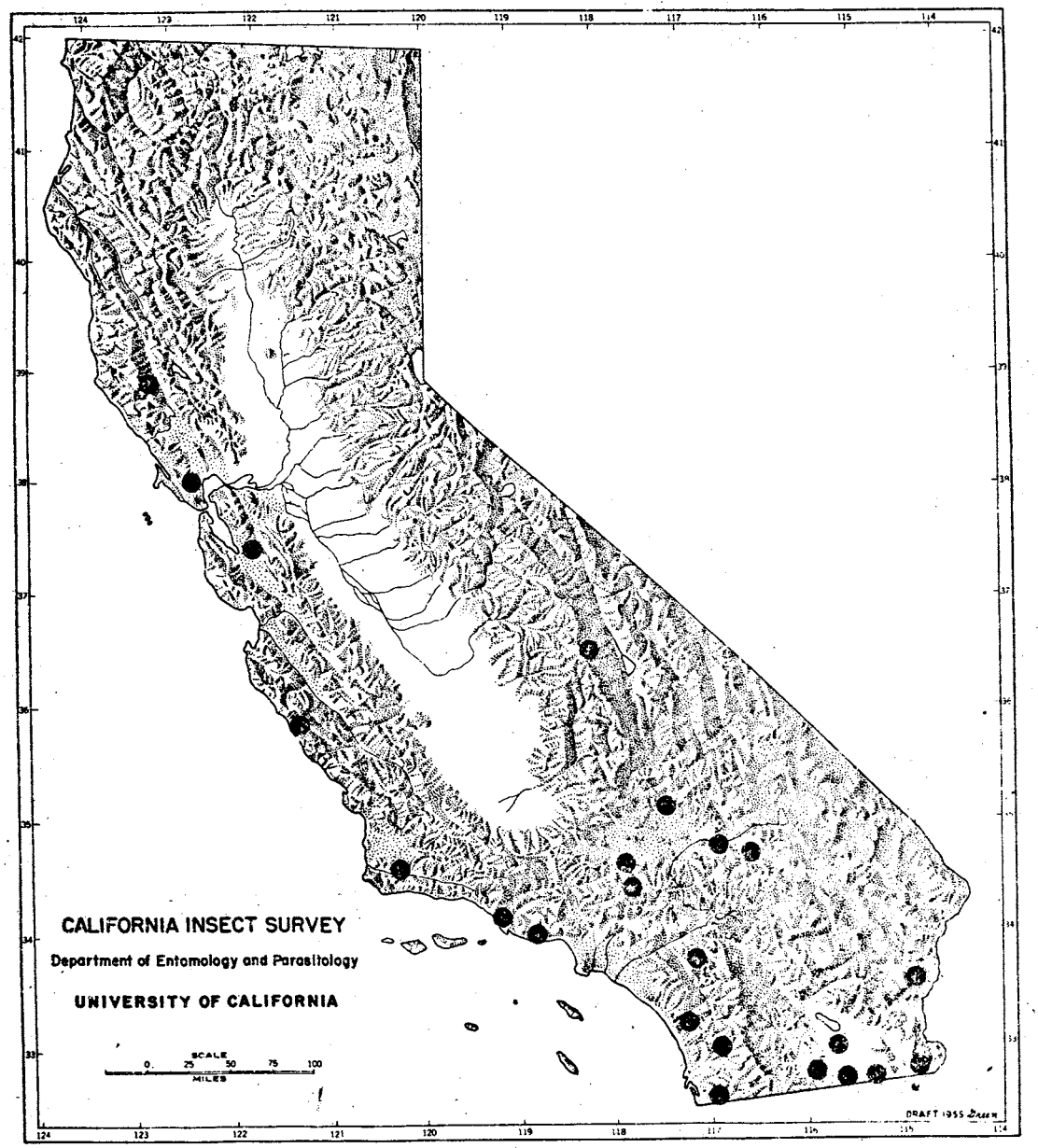
Map 8. California Distribution of Aphidius ohioensis (= 1) and A. phorodontis (= 2)



Map 9. California Distribution of Aphidius rosae



Map 10. California Distribution of Aphidius salicis



Map 11. California Distribution of Aphidius smithi